SLIP 4 SALINITY MONITORING DATA REPORT

North Boeing Field
Seattle/Tukwila, Washington

Submitted to:
The Boeing Company

Submitted by:
AMEC Geomatrix, Inc., Lynnwood, WA

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ACRONYMS AND ABBREVIATIONS

ASAOC	Administrative Settlement Agreement and Order on Consent
Boeing	The Boeing Company
cfs	cubic feet per second
DMVA	daily maximum vertical average
DPS	discrete profiling stations
EPA	U.S. Environmental Protection Agency
GPS	Global Positioning System
MLLW	mean lower low water
mS/cm	milliSiemens per centimeter
NAD 83	North American Datum 1983
NOAA	National Oceanic and Atmospheric Administration
PCB	polychlorinated biphenyl
ppt	parts per thousand
PSS	Practical Salinity Scale
SOW	Statement of Work
µg/L	micrograms per liter
USGS	U.S. Geological Survey
WA SPC North NAD 83	Washington State Plane Coordinate System, North Zone, referenced to the North American Datum 1983

SLIP 4 SALINITY MONITORING
DATA REPORT
North Boeing Field
Seattle/Tukwila, Washington

1.0 INTRODUCTION

An Administrative Settlement Agreement and Order on Consent (ASAOC) for a Removal Action was entered into by the U.S. Environmental Protection Agency (EPA) and The Boeing Company (Boeing) on September 29, 2010. The Statement of Work (SOW), Appendix C of the ASAOC, specifies that pending the outcome of a salinity study, the aquatic life chronic marine water quality criterion of 0.03 micrograms per liter (µg/L) total polychlorinated biphenyls (PCBs) may be justified in place of the specified interim goal of 0.014 µg/L total PCBs based on the aquatic life chronic freshwater quality criterion. Salinity data were collected in Slip 4 during three sampling events in March and April 2011 using the approved Slip 4 Salinity Monitoring Plan (Geosyntec 2011) and the Field Sampling Plan (AMEC 2011) submitted to EPA.

2.0 DATA COLLECTION

Sampling was conducted using the procedures presented in the Field Sampling Plan (AMEC 2011). River discharge for the Green River (U.S. Geological Survey [USGS] gage #12113000, Auburn, Washington) was monitored using the NOAA Northwest River Forecast Center Website (http://www.nwrfc.noaa.gov/river/station/flowplot/flowplot.cgi?AUBW1). The three sampling events (March 17, April 13, and April 17, 2011) were conducted when the river discharge for the Green River exceeded 1,900 cubic feet per second (cfs) for at least 24 hours prior to the start of each sampling event. Each sampling event consisted of six rounds of sampling conducted over a 12-hour period. Each round of sampling consisted of collecting vertical profiles of temperature, conductivity, and salinity at eight equally spaced discrete profiling stations (DPS) arranged along the selected transect (Transect A) positioned transversely across the slip (Table 1; Figure 1).

Temperature and conductivity readings were collected using a YSI multiparameter water quality data sonde. The conductivity cell on the data sonde was calibrated prior to use with a 10-milliSiemens per centimeter (mS/cm) conductivity standard using the procedures presented in the Standard Operating Procedures appendix of the Field Sampling Plan (AMEC 2011). The calibration was also checked at the conclusion of the field sampling. Depth readings were adjusted by entering a 0.2-meter offset and compensating for barometric pressure before the start of each sampling event. Depth readings were periodically adjusted for changing barometric pressure throughout each sampling event.

Time, date, depth, temperature, conductivity, and salinity data (calculated using the built-in algorithm and expressed on the Practical Salinity Scale [PSS]) were logged continuously (once per second) as the data sonde was slowly lowered from the water's surface to the bottom and then back up to the surface at each DPS. Lowering of the data sonde was paused for approximately 10 to15 seconds at each 0.5-meter depth interval to allow the instrument readings to stabilize and to log data.

3.0 SAMPLING EVENTS

Salinity measurements were collected manually, by boat, from each DPS (DPS 1 to DPS 8) along the selected transect (Transect A; Figure 1). Water depth and vessel clearances for the two end stations, DPS 1 and DPS 8) were confirmed prior to the start of the first round of sampling. The estimated water depth at station DPS 8 was compared to the predicted tide to determine if the water depth during low tide would be sufficient to allow sampling.

Operation of the global positioning system receiver followed the Standard Operating Procedures presented in the Field Sampling Plan (AMEC 2011) and was checked prior to the start of each sampling event and at the conclusion of each sampling event for proper operation as documented in Field Notes provided in Appendix A.

The sampling vessel was anchored in place within 2 meters of the preprogrammed Global Positioning System (GPS) coordinates of the proposed sampling location (Table 1). The boat's position was monitored during each data sonde cast to ensure that the vessel remained on station.

3.1 EVENT 1 – MARCH 17, 2011

Six rounds of sampling were conducted between 08:20 and 20:48 on March 17, 2011. Weather was partly cloudy to overcast. Winds were light. There was no precipitation in the vicinity of Slip 4 or North Boeing Field (Appendix B). Predicted low tide (+4.4 feet mean lower low water [MLLW]) was at 10:17 (between Sampling Round 1 and 2) and the predicted high tide (10.1 feet MLLW) was at 15:43 (during Sampling Round 4) (Appendix C). Flow rates during Sampling Round 1 were approximately 2,030 cfs (Table 2). Flow rates remained above 1,900 cfs until approximately 18:30 (during Sampling Round 5) when it dropped below 1,900 cfs. Flow rates had decreased to 1,826 cfs by the end of Sampling Round 6 at 20:48.

A minor problem occurred during the sampling event that resulted in a temporary interruption in data recording. The data gap occurred during retrieval of the water quality instrument at station DPS 5 during Sampling Round 5. The cable connection between the data sonde and the data logger was unplugged. The equipment problem did not impact collection of the data needed to develop a vertical salinity profile at the station.

3.2 EVENT 2 – APRIL 13, 2011

Six rounds of sampling were conducted between 09:30 and 20:55 on April 13, 2011. Weather was generally overcast with mist and light rain (occasionally heavy) becoming partly cloudy with sun breaks later in the day. Winds were mostly light but with occasional stiffer wind gusts during periods of heavier rain. Total measured precipitation at North Boeing Field during the

12-hour sampling event was 0.06 inch (Appendix B). Predicted high tide (+8.4 feet MLLW) was at 13:23 (during Sampling Round 3) and the predicted low tide (1.1 feet MLLW) was at 19:50 (during Sampling Round 6) (Appendix C). Flow rates during the sampling event were approximately 2,210 cfs and remained very constant throughout the 12 hours (Table 2).

A small boat entered Slip 4 and motored across the sampling stations at the south end of the transect while profiling at DPS 5 during Round 1. The boat was maneuvering slowly and had a shallow draft. It was unlikely that there was any measurable disturbance to the freshwater/saltwater interface.

3.3 EVENT 3 – APRIL 17, 2011

Six rounds of sampling were conducted between 09:30 and 21:40 on April 17, 2011. Weather was partly cloudy to overcast. Winds were light. There was no precipitation in the vicinity of Slip 4 or North Boeing Field (Appendix B). Predicted low tide (-0.8 feet MLLW) was at 11:13 (between Sampling Round 1 and Sampling Round 2) and the predicted high tide (11.0 feet MLLW) was at 17:47 (at the start of Sampling Round 5) (Appendix C). Flow rates during the sampling event varied between 2,064 and 2,146 cfs during the 12 hours (Table 2).

During Round 4 sampling a tug that had been tied up to barges in Slip 4 cast off from the barges and left the slip. The barges and tug were located to the southwest of the sampling transect. The tug left after sampling at DPS 5 was completed. We moved off station while the tug maneuvered out of the Slip along the south side of the Slip. After the tug had left we anchored on station DPS 6 and resumed the vertical profile sampling. There might have been minor disturbance to the freshwater/salt water interface from the vessel passage but significant impacts were not evident.

4.0 DATA ANALYSIS

Individual data files were electronically recorded for each DPS location (Appendix D). The data records for each sampling location were coded for the Sampling Round based on time. Each round of sampling was divided into a down cast (surface to maximum recorded water depth) and an up cast. Data from the down cast was used unless there were insufficient records collected at a depth interval to calculate an average salinity. If an average salinity for a depth interval could not be calculated using the down cast data, an average salinity value was calculated from data recorded during the up cast. During Sampling Event 2, three depth intervals used salinity values from the up cast or instrument retrieval as the depth interval salinity value. During Sampling Event 3, one depth interval salinity value was calculated using data from the up cast. The data to be averaged for a depth interval included all the values recorded on the down cast (or the up cast) that were within ±0.04 meter of the each horizontal depth interval. For each round of sampling a minimum of eight surface (0.5-meter depth) salinity values were recorded (one for each DPS). Eight or fewer values were recorded at deeper intervals. A horizontally averaged salinity was calculated for each depth interval (i.e., 0.5-meter, 1.0-meter, 1.5-meter, etc.) during each round of sampling. The horizontally averaged salinity values collected during a sampling round were then averaged to obtain a vertically average salinity for the sampling round. The maximum vertically averaged salinity value from any round of sampling during the sampling event was considered the daily maximum vertical average (DMVA) from each sampling event.

Table 3 presents the salinity data for Sampling Event 1. The DMVA from the sampling event was 17.0 parts per thousand (ppt) and the daily vertical average was 12.3 ppt. Table 4 presents the salinity data for Sampling Event 2. The DMVA from the sampling event was 12.2 ppt and the daily vertical average was 8 ppt. Table 5 presents the salinity data for Sampling Event 3. The DMVA from the sampling event was 16.2 ppt and the daily vertical average was 10.7 ppt.

5.0 SUMMARY AND INTERPRETATION

The Field Sampling Plan (AMEC 2011) and the Final Slip 4 Salinity Monitoring Plan (Geosyntec 2011) provided the following data interpretation criteria. If at least one of the three transect DMVA salinity values, as measured by conductivity and temperature data, is less than 1 ppt, the freshwater criteria for receiving waters will apply. If the three DMVA salinity values are greater than 10 ppt, the marine water criteria for receiving waters will apply. If neither of the above conditions are met, then the salinity data may be reassessed based on the horizontal and vertical data to determine the percentage of marine and freshwater components across the slip.

The DMVA salinity values for all three Sampling Events were greater than 10 ppt. On the basis of these results the marine criterion of 0.03 µg/L total PCBs will be used in evaluating stormwater releases into Slip 4.

6.0 REFERENCES

AMEC (AMEC Geomatrix, Inc.). 2011. Slip 4 Salinity Monitoring Field Sampling Plan: North Boeing Field, Seattle/Tukwila, Washington. Prepared for The Boeing Company, Seattle, Washington. January 2011.

Geosyntec (Geosyntec Consultants). 2011. Final Slip 4 Salinity Monitoring Plan: North Boeing Field. Prepared for The Boeing Company, Seattle, Washington. January 2011.

TABLES

TABLE 1

DISCRETE PROFILING STATIONS

Slip 4 Salinity Monitoring

North Boeing Field, Seattle/Tukwila, Washington

Transect	Station	State Plane Coordinates (WA SPC North NAD 83; survey feet)		Distance Between Stations (feet)
		Northing	Easting	
A	DPS-1	198917	1273248	17.1
	DPS-2	198908	1273262	17.1
	DPS-3	198899	1273277	17.1
	DPS-4	198890	1273291	17.1
	DPS-5	198881	1273306	17.1
	DPS-6	198872	1273321	17.1
	DPS-7	198863	1273335	17.1
	DPS-8	198854	1273350	17.1

Abbreviation(s)

NAD 83 = North American Datum 1983

WA SPC North NAD 83 = Washington State Plane Coordinate System, North Zone, referenced to the North American Datum 1983

TABLE 2 [1]

STAGE AND DISCHARGE INFORMATION FOR GREEN RIVER AT AUBURN, WASHINGTON

Slip 4 Salinity Monitoring

North Boeing Field, Seattle/Tukwila, Washington

Green River – near Auburn, Washington (AUBW1)

	March 17, 2011		April 13, 2011		April 17, 2011	
	Observed		Observed		Observed	
	Stage	Discharge	Stage	Discharge	Stage	Discharge
Time	(ft)	(cfs)	(ft)	(cfs)	(ft)	(cfs)
0:00	56	2122	56.16	2256.15	56	2122
0:15	55.98	2106	56.16	2256.15	Not available	
0:30	55.97	2098	56.15	2246.92	56.01	2130
0:45	55.96	2090	Not available		56	2122
1:00	55.96	2090	Not available		56	2122
1:15	55.95	2081.43	56.15	2246.92	56	2122
1:30	55.95	2081.43	56.14	2237.69	56	2122
1:45	55.95	2081.43	56.14	2237.69	56.01	2130
2:00	55.94	2072.86	56.14	2237.69	56.01	2130
2:15	55.93	2064.29	56.14	2237.69	56	2122
2:30	55.93	2064.29	56.13	2228.46	56	2122
2:45	Not available		56.14	2237.69	56.01	2130
3:00	55.93	2064.29	56.13	2228.46	56	2122
3:15	Not available		Not available		56	2122
3:30	55.92	2055.71	Not available		Not available	
3:45	55.93	2064.29	Not available		Not available	
4:00	55.93	2064.29	Not available		Not available	
4:15	55.92	2055.71	Not available		56	2122
4:30	55.92	2055.71	Not available		55.99	2114
4:45	55.92	2055.71	56.13	2228.46	56	2122
5:00	55.92	2055.71	56.12	2219.23	Not available	
5:15	Not available		56.13	2228.46	56	2122
5:30	Not available		56.12	2219.23	55.99	2114
5:45	55.91	2047.14	Not available		Not available	
6:00	55.91	2047.14	56.12	2219.23	56	2122
6:15	55.91	2047.14	56.13	2228.46	55.99	2114
6:30	55.91	2047.14	56.12	2219.23	Not available	
6:45	Not available		56.12	2219.23	Not available	
7:00	55.9	2038.57	56.11	2210	Not available	
7:15	55.9	2038.57	56.12	2219.23	Not available	
7:30	55.9	2038.57	56.11	2210	Not available	
7:45	55.9	2038.57	Not available		Not available	
8:00	Not available		Not available		Not available	
8:15	Not available		Not available		Not available	
8:30	Not available		Not available		Not available	
8:45	Not available		Not available		Not available	
9:00	Not available		Not available		55.99	2114
9:15	55.89	2030	56.11	2210	55.97	2098
9:30	55.89	2030	56.1	2202	55.99	2114
9:45	55.89	2030	Not available		55.98	2106
10:00	55.89	2030	Not available		Not available	
10:15	55.88	2021.43	Not available		Not available	
10:30	55.89	2030	Not available		Not available	
10:45	55.88	2021.43	56.1	2202	Not available	
11:00	55.89	2030	56.09	2194	55.98	2106
11:15	55.88	2021.43	56.1	2202	55.97	2098
11:30	55.87	2012.86	56.09	2194	55.98	2106
11:45	55.87	2012.86	56.1	2202	55.98	2106
12:00	55.88	2021.43	56.1	2202	55.97	2098
12:15	55.87	2012.86	56.09	2194	Not available	
12:30	Not available		Not available		Not available	
12:45	55.87	2012.86	Not available		Not available	
13:00	Not available		56.09	2194	Not available	
13:15	55.87	2012.86	56.1	2202	Not available	
13:30	55.87	2012.86	56.09	2194	Not available	
13:45	55.87	2012.86	56.1	2202	55.97	2098
14:00	55.86	2004.29	56.1	2202	55.96	2090
14:15	55.87	2012.86	56.09	2194	55.95	2081.43
14:30	55.86	2004.29	56.09	2194	55.96	2090
14:45	55.87	2012.86	56.09	2194	Not available	
15:00	55.86	2004.29	56.1	2202	55.96	2090
15:15	55.86	2004.29	Not available		55.95	2081.43
15:30	55.86	2004.29	Not available		55.96	2090
15:45	55.86	2004.29	Not available		55.95	2081.43
16:00	55.85	1995.71	Not available		Not available	
16:15	55.85	1995.71	56.1	2202	Not available	
16:30	55.85	1995.71	56.09	2194	Not available	
16:45	55.84	1987.14	56.1	2202	Not available	
17:00	55.83	1978.57	Not available		55.95	2081.43
17:15	55.81	1962	56.1	2202	55.94	2072.86
17:30	55.81	1962	56.11	2210	55.95	2081.43
17:45	55.79	1946	56.1	2202	55.95	2081.43
18:00	55.78	1938	Not available		55.94	2072.86
18:15	55.76	1922	Not available		Not available	
18:30	55.73	1898	Not available		Not available	
18:45	55.71	1882	Not available		55.94	2072.86
19:00	55.7	1874	56.1	2202	55.93	2064.29
19:15	55.69	1866	56.11	2210	55.94	2072.86
19:30	55.67	1850	56.11	2210	55.94	2072.86
19:45	55.66	1842	56.1	2202	55.95	2081.43
20:00	55.65	1834	Not available		55.97	2098
20:15	55.64	1826	56.1	2202	55.98	2106
20:30	55.64	1826	56.11	2210	56	2122
20:45	55.64	1826	56.11	2210	Not available	
21:00	55.63	1818	56.12	2219.23	56.03	2146
21:15	55.62	1810	56.11	2210	56.04	2154
21:30	55.62	1810	Not available		56.06	2170
21:45	55.62	1810	56.11	2210	56.07	2178
22:00	55.62	1810	56.1	2202	56.08	2186
22:15	55.61	1802	56.1	2202	56.09	2194
22:30	55.61	1802	56.11	2210	Not available	
22:45	55.62	1810	Not available		Not available	
23:00	55.61	1802	Not available		56.09	2194
23:15	55.61	1802	56.11	2210	56.1	2202
23:30	55.61	1802	56.1	2202	Not available	
23:45	55.61	1802	Not available		Not available	

Note(s)

1. Information source: NOAA Northwest River Forecast Center Website, http://www.nwrfc.noaa.gov/river/station/flowplot/flowplot.cgi?AUBW1.

Abbreviation(s)

cfs = cubic feet per second

ft = feet

TABLE 3

SALINITY RESULTS FOR SAMPLING EVENT 1 – MARCH 17, 2011

Slip 4 Salinity Monitoring

North Boeing Field, Seattle/Tukwila, Washington

Salinity (ppt PSS)		Station								Salinity (ppt)	DPS	Salinity (ppt)	Estimated	High/	Flow Rate	Precip
Round	Depth Interval (m)	DPS1	DPS2	DPS3	DPS4	DPS5	DPS6	DPS7	DPS8	Average/depth	Count	Average/round	tide	Low	(cfs)	KBFI
1	0.5	0.94	0.99	0.96	0.94	0.95	0.95	0.93	0.95	0.95	8	9.6	+5.9 to		2030	
	1	0.97	1.02	1.04	1.14	1.05	1.06	1.04	1.12	1.05	8		+4.5 ft			
	1.5	1.15	1.25	1.28	1.32	1.43	1.57	1.86	1.88	1.47	8		MLLW			
	2	1.50	1.79	2.09	2.10	2.04	2.16	2.58	2.81	2.13	8					
	2.5	2.46	2.65	3.05	2.91	3.22	3.10	3.44	3.29	3.01	8					
	3	5.00	5.23	5.36	4.97	4.68	4.12	4.29	4.25	4.74	8					
	3.5	10.07	10.95	8.25	7.34	6.53	6.45	6.40		8.00	7			Low		
	4	24.89	24.45	22.95	22.02	15.47	17.92	18.40		20.87	7			10:17		
	4.5	26.82	26.88	26.48	26.61	25.59	24.89			26.21	6			+4.4 ft		
	5	27.25	27.30	27.28	26.98	26.87				27.14	5			MLLW		
2	0.5	0.95	1.13	1.21	1.14	1.08	1.72	1.09	1.14	1.18	8	10.3	+4.5 to		2010	
	1	1.28	1.44	1.76	1.99	1.88	2.21	2.28	2.21	1.88	8		+6.4 ft			
	1.5	2.38	2.59	2.70	2.74	2.86	2.81	2.74	2.93	2.72	8		MLLW			
	2	2.92	2.96	3.05	3.29	3.00	3.04	3.46	3.40	3.14	8					
	2.5	3.98	3.69	4.04	3.99	3.64	3.52	4.15	4.03	3.88	8					
	3	4.79	4.65	4.68	5.42	4.16	4.78	6.29	6.57	5.17	8					
	3.5	6.88	6.78	8.65	11.51	6.72	7.33	19.10		9.57	7					
	4	21.40	21.62	23.79	25.94	21.08	23.57			22.90	6					
	4.5	25.15	25.93	26.32	26.92	26.00	26.67			26.16	6					
	5	26.51	26.56	26.81		26.88				26.69	4					
3	0.5	1.21	1.26	1.34	1.31	1.67	1.79	1.58	1.78	1.49	8	13.9	+6.4 to		2010	
	1	2.34	2.10	2.44	2.40	2.45	2.51	2.54	1.95	2.34	8		+9.3 ft			
	1.5	2.82	2.81	2.77	2.89	2.72	2.81	2.88	2.82	2.82	8		MLLW			
	2	3.37	3.40	3.00	3.33	3.47	3.42	3.45	3.37	3.35	8					
	2.5	3.99	4.60	3.47	4.42	7.41	6.41	9.58	8.77	6.08	8					
	3	8.58	11.20	4.40	11.22	16.96	15.05	14.20	14.55	12.02	8					
	3.5	20.22	18.65	11.50	20.70	23.35	22.78	22.98	20.40	20.07	8					
	4	24.73	23.74	18.72	25.81	25.86	26.18	26.46		24.50	7					
	4.5	25.42	25.93	24.15	27.08	26.74	27.21	27.21		26.25	7					
	5	26.28	26.42	26.39	27.41	27.27	27.41	27.67		26.98	7					
	5.5		26.99	27.05	27.56	27.46	27.57			27.33	5					
4	0.5	1.85	1.97	1.78	1.66	1.63	1.72	1.63	1.68	1.74	8	17.0	+9.4 to		2000	
	1	2.31	2.35	1.98	1.95	1.96	1.86	1.84	1.77	2.00	8		+9.6 ft			
	1.5	2.73	2.76	2.45	2.22	2.45	2.39	1.89	1.96	2.36	8		MLLW			
	2	3.16	3.35	3.18	2.70	3.03	2.68	2.57	2.56	2.90	8					
	2.5	7.96	9.91	10.29	6.31	4.01	3.50	3.48	3.83	6.16	8					
	3	14.24	14.01	18.17	14.68	14.97	15.00	15.91	14.15	15.14	8			High		
	3.5	23.28	23.79	22.86	23.57	23.50	23.91	23.56	23.32	23.47	8			15:43		
	4	26.45	26.84	26.67	27.06	27.01	26.88	27.16	27.30	26.92	8			+10.1 ft		
	4.5	27.42	27.43	27.50	27.58	27.70	27.88	27.79		27.61	7			MLLW		
	5	27.65	27.71	27.89	27.88	27.99	28.05	28.02		27.89	7					
	5.5	27.86	27.90	28.04	28.05	28.08	28.12			28.01	6					
	6	27.98	28.02	28.09	28.11	28.11	28.13			28.07	6					
	6.5		28.05	28.11						28.08	2					
5	0.5	1.59	1.57	1.61	1.66	1.65	1.44	1.44	1.42	1.55	8	14.5	+9.4 to		1940	
	1	1.78	1.71	1.74	1.73	1.72	1.67	1.55	1.61	1.69	8		+5.1 ft			
	1.5	1.93	1.90	1.84	1.79	1.77	1.72	1.75	1.69	1.80	8		MLLW			
	2	2.60	2.49	2.24	2.07	1.93	1.83	1.82	1.77	2.09	8					
	2.5	3.18	3.21	3.20	2.93	2.62	2.37	2.57	2.32	2.80	8					
	3	13.10	11.45	9.00	3.62	3.54	3.48	4.77	4.67	6.70	8					
	3.5	23.94	22.94	21.74	20.93	19.30	12.78	17.43		19.86	7					
	4	27.18	26.08	25.76	25.31	25.11	24.89	25.66		25.71	7					
	4.5	27.87	27.87	27.69	27.37	27.20	27.36			27.56	6					
	5	28.05	28.06	28.06	27.96	27.98				28.02	5					
	5.5	28.11	28.13	28.12	28.12					28.12	4					
	6	28.14	28.15							28.15	2					
6	0.5	1.36	1.36	1.39	1.29	1.33	1.37	1.29	1.41	1.35	8	8.3	+4.9 to		1820	
	1	1.53	1.62	1.58	1.64	1.64	1.57	1.52	1.63	1.59	8		+1.7 ft			
	1.5	1.63	1.73	1.75	1.76	1.76	1.76	1.79	1.78	1.75	8		MLLW			
	2	1.78	2.01	1.95	2.17	2.10	2.23	2.36	2.61	2.15	8					
	2.5	2.65	2.92	2.93	3.39	3.41	3.25	3.43	3.44	3.18	8					
	3	4.21	4.49	4.78	5.40	5.39	4.86	4.53		4.81	7					
	3.5	10.06	8.87	8.84	9.15	9.03	6.95			8.82	6					
	4	24.83	24.43	23.92	24.37	21.93				23.90	5					
	4.5	27.32	26.84	26.94						27.03	3					
											DMVA =	17.0				
		<5 ppt	5 to 10 ppt	10 to 15 ppt		15 to 20 ppt		>20 ppt			DVA =	12.3				

Abbreviation(s)

cfs = cubic feet per second
DMVA = daily maximum vertical average
DPS = discrete profile station
DVA = daily vertical average
ft = feet
m = meter
MLLW = mean lower low water
ppt = parts per thousand
Precip KBFI = 1-hour precipitation total recorded at Seattle Boeing Field (KBFI)
PSS = Practical Salinity Scale

TABLE 4

SALINITY RESULTS FOR SAMPLING EVENT 2 – APRIL 13, 2011

Slip 4 Salinity Monitoring

North Boeing Field, Seattle/Tukwila, Washington

Salinity (ppt PSS)		Station								Salinity (ppt)	DPS	Salinity (ppt)		High/	Flow Rate	Precip KBFI
Round	Depth Interval (m)	DPS1	DPS2	DPS3	DPS4	DPS5	DPS6	DPS7	DPS8	Average/depth	Count	Average/round	Estimated tide	Low	(cfs)	
1	0.5	0.71	0.69	1.22	0.94	1.08	1.06	1.09	1.33	1.01	8	10.3	+5.5 ft to 6.8 ft MLLW		2200	T
	1	1.12	1.39	1.50	1.58	1.71	1.46	1.81	2.37	1.62	8					
	1.5	1.98	1.96	1.80	2.02	2.44	2.04	2.42	3.05	2.21	8					
	2	2.22	2.51	2.32	2.63	2.89	2.94	3.33	4.62	2.93	8					
	2.5	2.68	3.14	3.09	3.08	4.22	4.92	4.89	7.52	4.19	8					
	3	3.10	4.06	5.96	4.30	7.76	7.02	9.92	10.29	6.55	8					
	3.5	10.62	10.94	7.36	7.65	13.30	12.51	13.52		10.84	7					
	4	24.94	23.43	23.52	23.59	18.19	19.14			22.13	6					
	4.5	26.26	25.85	25.63	25.83	24.31	25.59			25.58	6					
	5	26.45	26.37	26.44	26.25					26.38	4					
2	0.5	1.48	1.40	1.46	1.15	1.39	1.25	1.07	1.22	1.30	8	12.2	+7.3 ft to 8.4 ft MLLW		2200	0.01 in
	1	1.90	1.63	1.85	1.56	1.73	1.40	1.48	1.51	1.63	8					
	1.5	2.59	2.25	2.30	2.02	1.81	1.69	1.94	1.72	2.04	8					
	2	3.22	3.05	2.60	2.43	2.34	2.17	2.40	2.28	2.56	8					
	2.5	5.40	3.68	3.11	3.11	2.82	3.10	3.17	2.99	3.42	8					
	3	7.91	5.93	5.83	5.48	5.45	5.32	6.22	5.84	6.00	8					
	3.5	10.70	8.87	9.88	11.28	18.52	18.64	22.03	21.87	15.22	8					
	4	20.93	20.30	20.47	23.36	25.06	26.02	26.06		23.17	7					
	4.5	24.09	25.52	26.13	26.82	26.78	26.76			26.02	6					
	5	26.24	26.64	26.81	27.04	27.12				26.77	5			High tide		
	5.5	26.46	26.74							26.60	2			13:23		
3	0.5	1.17	1.36	1.28	1.24	1.34	1.25	1.25	1.23	1.26	8	11.9	+8.4 ft to 7.5 ft MLLW	+8.4 ft	2200	0.01 in
	1	1.41	1.44	1.38	1.34	1.50	1.51	1.53	1.50	1.45	8			MLLW		
	1.5	1.58	1.61	1.51	1.51	1.69	1.68	1.90	1.80	1.66	8					
	2	2.10	1.81	2.06	1.82	2.20	1.97	2.88	2.69	2.19	8					
	2.5	2.68	2.66	2.44	2.97	3.44	4.18	4.37	3.74	3.31	8					
	3	6.93	7.55	5.81	9.15	8.77	6.75	8.96	8.90	7.85	8					
	3.5	18.29	16.61	18.36	13.84	17.42	17.68	12.50		16.39	7					
	4	21.92	21.74	22.13	21.27	22.44	21.64	16.59		21.10	7					
	4.5	25.32	24.59	24.44	22.89	23.53	23.26	21.45		23.64	7					
	5	26.42	25.79	25.95	25.30	25.97	25.97			25.90	6					
	5.5	27.06	26.82	26.59	26.32	26.43				26.65	5					
4	0.5	1.32	1.35	1.35	1.37	1.30	1.34	1.31	1.26	1.33	8	8.8	+6.9 ft to 4.5 ft MLLW		2200	0.02 in
	1	1.41	1.46	1.49	1.41	1.36	1.38	1.46	1.44	1.43	8					
	1.5	1.57	1.57	1.59	1.53	1.53	1.49	1.49	1.49	1.53	8					
	2	1.96	1.85	1.82	1.84	1.69	1.70	1.56	1.53	1.74	8					
	2.5	2.78	2.77	2.38	2.04	1.95	1.83	1.75		2.21	7					
	3	5.57	5.52	4.17	2.97	2.93	2.82	2.25		3.75	7					
	3.5	9.76	11.86	7.25	5.36	4.78	5.26			7.38	6					
	4	16.99	19.49	17.25	15.64	16.55	16.52			17.07	6					
	4.5	24.83	24.94	24.96	23.69	24.89	24.80			24.68	6					
	5	26.79	27.04	26.68	25.89					26.60	4					
5	0.5	1.22	1.25	1.23	1.17	1.14	1.17	1.17	1.17	1.19	8	3.0	+3.6 ft to 1.5 ft MLLW		2200	
	1	1.36	1.36	1.33	1.34	1.34	1.31	1.33	1.36	1.34	8					
	1.5	1.47	1.44	1.46	1.48	1.50	1.46	1.46		1.47	7					
	2	1.53	1.61	1.53	1.59	1.56	1.53	1.53		1.56	7					
	2.5	1.83	1.84	1.84	1.81	1.74	1.71	1.76		1.79	7					
	3	2.40	2.50	2.29	2.26	2.07	2.05	1.98		2.22	7					
	3.5	4.61	4.20	4.58	4.11	3.80	3.09			4.07	6					
	4	13.80	12.43	9.95	6.80					10.74	4					
6	0.5	1.14	1.10	1.07	1.12	1.14	1.16	1.14	1.21	1.14	8	1.6	+1.2 ft to 1.8 ft MLLW		2200	T
	1	1.23	1.27	1.29	1.33	1.32	1.34	1.27	1.23	1.29	8			Low tide		
	1.5	1.41	1.46	1.47	1.47	1.49	1.42	1.47	1.44	1.45	8			19:50		
	2	1.54	1.56	1.54	1.56	1.55	1.52	1.50		1.54	7			+1.1 ft		
	2.5	1.64	1.64	1.67	1.65	1.60	1.55	1.52		1.61	7			MLLW		
	3	1.81	1.78	1.80	1.73	1.64	1.63			1.73	6					
	3.5	2.11	2.10	2.05	1.91	1.89	1.80			1.98	6					
	4		2.57	2.34						2.45	2					
											DMVA =	12.2				
		<5 ppt	5 to 10 ppt		10 to 15 ppt		15 to 20 ppt		>20 ppt		DVA =	8.0				

Salinity calculated from data recorded on Instrument retrieval

Abbreviation(s)

cfs = cubic feet per second
DMVA = daily maximum vertical average
DPS = discrete profile station
DVA = daily vertical average
ft = feet
m = meter
MLLW = mean lower low water
ppt = parts per thousand
Precip KBFI = 1-hour precipitation total recorded at Seattle Boeing Field (KBFI)
PSS = practical salinity scale
T = trace of precipitation

TABLE 5

SALINITY RESULTS FOR SAMPLING EVENT 3 – APRIL 17, 2011

Slip 4 Salinity Monitoring

North Boeing Field, Seattle/Tukwila, Washington

Salinity (ppt PSS)		Station								Salinity (ppt)	DPS	Salinity (ppt)		High/	Flow Rate	Precip
Round	Depth Interval (m)	DPS1	DPS2	DPS3	DPS4	DPS5	DPS6	DPS7	DPS8	Average/depth	Count	Average/round	Estimated tide	Low	(cfs)	KBFI
1	0.5	1.35	1.35	1.32	1.33	1.35	1.36	1.38	1.36	1.35	8	5.1	+1.4 ft to -0.7 ft MLLW		2100	
	1	1.38	1.36	1.36	1.49	1.51	1.52	1.45		1.44	7					
	1.5	1.81	1.90	2.66	2.77	3.07	2.94	2.84		2.57	7					
	2	3.20	3.20	3.49	3.24	3.24	3.15	3.08		3.23	7					
	2.5	4.12	4.11	4.04	3.75	3.47	3.39			3.81	6					
	3	5.08	4.95	4.51	4.24	3.95				4.55	5					
	3.5	5.98	5.51	5.10						5.53	3					
	4	18.40								18.40	1					
2	0.5	1.36	1.47	1.37	1.38	1.36	1.39	1.25	1.22	1.35	8	2.3	-0.8 ft to +1.4 ft MLLW		2100	
	1	1.56	1.51	1.42	1.46	1.52	1.38	1.29	1.23	1.42	8					
	1.5	1.76	1.63	1.56	1.62	1.58	1.51	1.50	1.50	1.58	8					
	2	2.11	1.84	1.74	1.71	1.71	1.63	1.66		1.77	7					
	2.5	2.48	1.93	1.87	1.93	2.08	2.06	2.02		2.05	7					
	3	2.61	2.29	2.04	2.44	2.55	2.27			2.37	6					
	3.5		2.89	2.65	10.28					5.28	3			Low tide		
3	0.5	1.34	1.31	1.36	1.37	1.34	1.26	1.33	1.35	1.33	8	11.8	+2.7 ft to +7.6 ft MLLW	11:13	2100	
	1	1.39	1.38	1.41	1.42	1.44	1.43	1.47	1.47	1.43	8			-0.8 ft		
	1.5	1.45	1.54	1.60	1.70	1.74	1.78	2.06	2.53	1.80	8			MLLW		
	2	1.61	1.71	1.80	2.41	4.15	3.64	3.76	4.96	3.01	8					
	2.5	1.83	2.20	3.55	5.47	7.63	8.56	8.93	9.15	5.92	8					
	3	3.27	5.62	9.34	10.14	11.93	12.69	12.62	11.82	9.68	8					
	3.5	8.97	12.74	13.85	18.87	20.64	21.71	21.87	23.71	17.80	8					
	4	22.42	23.32	24.78	25.36	25.21	26.00	25.93		24.72	7					
	4.5	24.72	25.11	25.63	26.40	26.53	26.76	26.69		25.98	7					
	5					26.82				26.82	1					
4	0.5	1.33	1.35	1.36	1.41	1.35	1.46	1.40	1.42	1.38	8	16.2	+8.2 ft to +11.0 ft MLLW		2100	
	1	1.60	1.61	1.66	1.64	1.49	1.36	1.48	1.41	1.53	8					
	1.5	3.07	3.64	3.07	2.58	1.94	1.93	1.85	1.57	2.46	8					
	2	5.53	7.39	6.29	5.27	4.85	3.30	3.01	2.65	4.78	8					
	2.5	9.30	10.73	9.86	9.78	10.16	8.13	7.37	7.21	9.07	8					
	3	14.49	20.01	16.10	17.70	15.76	15.64	13.95	16.80	16.31	8					
	3.5	25.29	25.64	25.62	25.17	25.39	25.09	21.50	21.59	24.41	8					
	4	26.51	26.32	26.69	26.59	26.82	26.63	26.27	25.93	26.47	8					
	4.5	26.83	26.88	26.94	26.94	26.99	26.90	26.97		26.92	7					
	5	26.93	26.96	27.04	27.06	27.25	27.16	27.26		27.09	7					
	5.5	27.07	27.06	27.17	27.23	27.35	27.41			27.21	6					
	6	27.15	27.25	27.26	27.31	27.43				27.28	5			High tide		
5	0.5	1.51	1.49	1.41	1.38	1.32	1.23	1.22	1.19	1.34	8	16.2	+11.0 ft to +9.2 ft MLLW	17:47	2100	
	1	1.57	1.60	1.44	1.44	1.33	1.28	1.28	1.21	1.39	8			+11 ft		
	1.5	2.12	1.94	1.58	1.61	1.45	1.46	1.43	1.37	1.62	8			MLLW		
	2	2.54	2.39	2.18	2.00	1.69	1.64	1.58	1.55	1.95	8					
	2.5	7.09	8.14	5.58	3.58	3.43	2.57	2.22	2.08	4.34	8					
	3	17.54	18.57	17.15	16.77	15.02	12.93	10.92	8.22	14.64	8					
	3.5	22.95	23.69	23.85	22.93	22.90	22.37	21.69	21.54	22.74	8					
	4	26.35	25.86	25.88	25.79	25.66	25.02	24.66	24.30	25.44	8					
	4.5	27.10	27.01	27.12	27.19	27.17	26.59	26.28		26.92	7					
	5	27.35	27.36	27.41	27.45	27.48	27.40			27.41	6					
	5.5	27.60	27.55	27.54	27.72	27.62	27.55			27.60	6					
	6	27.66	27.66	27.71	27.80	27.72				27.71	5					
	6.5	27.69	27.73	27.81	27.86					27.77	4					
6	0.5	1.25	1.21	1.28	1.24	1.19	1.14	1.17	1.06	1.19	8	12.7	+8.8 ft to +5.4 ft MLLW		2100	
	1	1.30	1.28	1.31	1.30	1.18	1.19	1.19	1.19	1.24	8					
	1.5	1.38	1.38	1.42	1.38	1.34	1.37	1.33	1.33	1.37	8					
	2	1.59	1.59	1.56	1.47	1.47	1.44	1.47	1.40	1.50	8					
	2.5	2.21	1.91	1.75	1.65	1.63	1.58	1.67	1.60	1.75	8					
	3	6.65	5.12	3.17	3.29	2.69	3.10	3.21		3.89	7					
	3.5	20.35	19.39	15.28	12.67	10.13	9.79	6.55		13.45	7					
	4	24.29	24.00	23.22	22.96	22.12	22.05	19.98		22.66	7					
	4.5	25.49	25.54	25.10	24.65	24.91	25.13			25.14	6					
	5	26.73	26.47	25.91	25.93	25.89	26.01			26.16	6					
	5.5	27.25	27.12	26.74	26.96	26.50				26.91	5					
	6	27.52	27.61							27.56	2					
											DMVA	16.2				
											DVA	10.7				

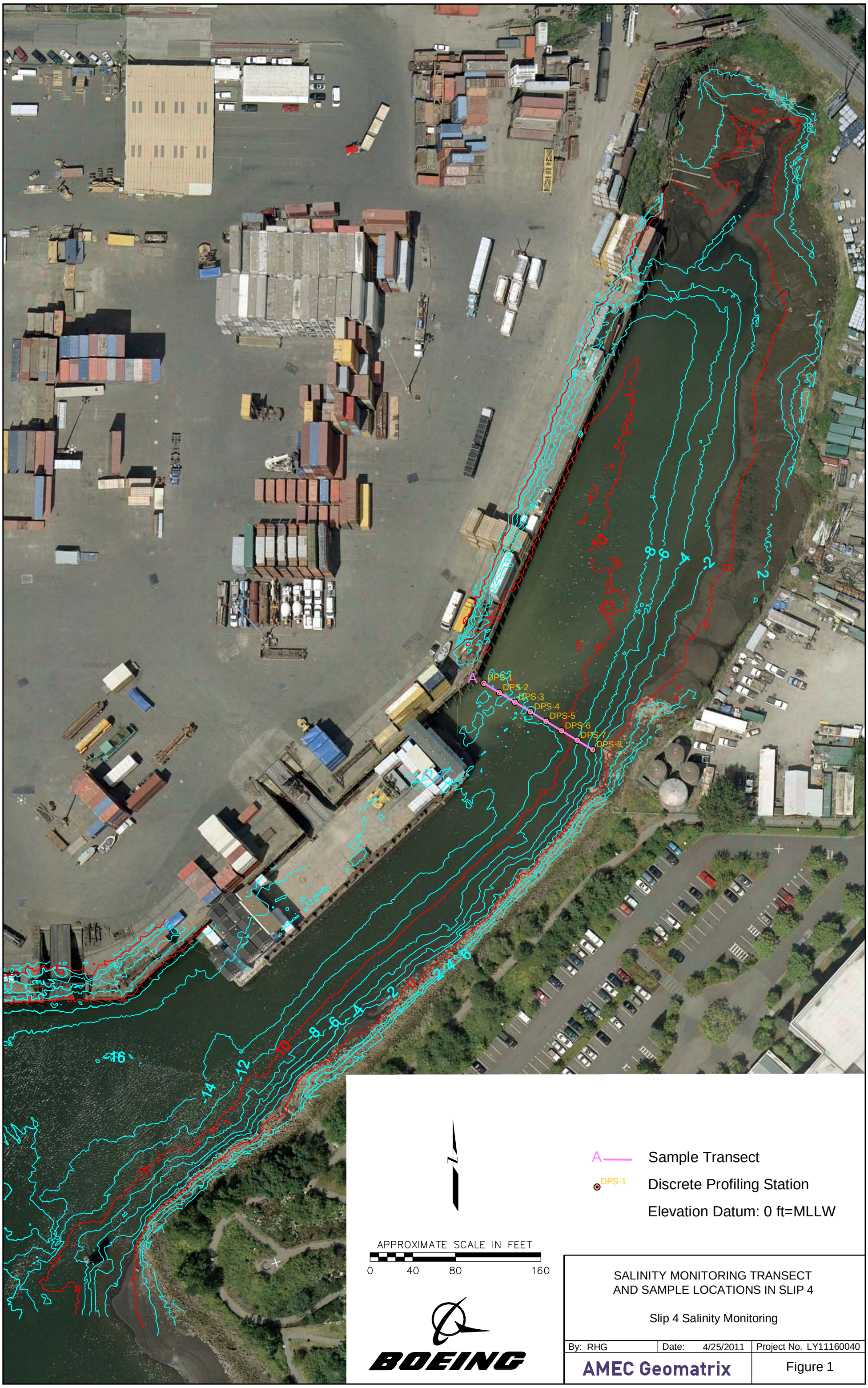
< 5 ppt | 5 to 10 ppt | 10 to 15 ppt | 15 to 20 ppt | >20 ppt

Salinity calculated from data recorded on Instrument retrieval

Abbreviation(s)

cfs = cubic feet per second
DMVA = daily maximum vertical average
DPS = discrete profile station
ft = feet
m = meter
MLLW = mean lower low water
ppt = parts per thousand
Precip KBFI = 1-hour precipitation total recorded at Seattle Boeing Field (KBFI)
PSS = practical salinity scale
T = trace of precipitation

FIGURES



Plot Date: 04/25/11 - 3:50pm, Plotted by: gary.maxwell
Drawing Path: P:\Boeing Salinity\LY11160040 SLIP 4 Salinity Study\CAD\, Drawing Name: SLIP4-Salinity Report.dwg

APPENDIX A

Field Notes

amec

3500 188th Street SW, Suite 601, Lynnwood, WA 98037
(425) 921-4000

Job Number: LY11160040 Date: 3/17/11 Page 1 of 1

Location: Duwamish River Slip 4 By: RHK

0745	Boat launched @ 1st Street		
	Weather 80% cloud cover, calm		
810	GPS check point.		
0815	@ DP-8 Transect A 14.44 water depth		
0820	Depth Calibration		
822	start	round # 1	weather partly cloudy, wind < 5 knts
1005	end	round # 1	
1025	start	round # 2	" " "
1212	end	round # 2	
1226	start	round # 3	cloudy, wind < 5
1428	end	round # 3	
1434	start	round # 4	rain clouds to east
1652	end	round # 4	cloudy, wind < 5
1657	start	round # 5	partly cloudy wind < 5
1740			cloudy, light rain wind < 5
	on retrieval on station 5 cable on YSI was		
	accidently unplugged - possible data loss		
1914	end	round # 5	partly cloudy wind < 5
1916	start	round # 6	partly cloudy wind < 5
2048	end	round # 6	partly cloudy wind 0

AMEC Geomatrix, Inc., GPS Check Form

Date: 3/17

Project: Slip 4 Salinity Monitoring

Recorder: GSM

Calculated Location of Reference Station

Coordinate Datum: WA State Plane, NAD 83

Zone: North Zone

Reference Station Name: Check Point 1

Northing 196376

Easting 1274699

Units of Measure: Survey Feet

Reference Station Description: Piling at downstream end of the South Park Marina at the end of the channel side dock.

Start of Day

Time: 0810

Northing 196375

Coordinate Datum Setup Confirmed: Yes.

Easting 1274699

Comments: 1 ft

End of Day

Time: 2057

Northing 196379

Coordinate Datum Setup Confirmed: YES

Easting 1274699

Comments: 2.9 ft

CALIBRATION WORK SHEET

Date of Calibration: 3/16/11 Sonde ID: 6820 - 04J 15529AA
Technician: Rob Gilmour

RP DO membrane changed? Y (N) *Note: Wait 3 to 6 hours before calibrating for unattended*
RP DO membrane o-ring changed? Y (N) *deployments; run in Discrete mode for 10 minutes to accelerate burn in. (Rapid Pulse DO Only)*

Turbidity wiper changed? Y (N) Chlorophyll wiper changed? Y (N)
ROX DO wiper changed? Y (N) BGA-PE wiper changed? Y (N)
BGA-PC wiper changed? Y (N) Rhodamine wiper changed? Y (N)

Note: If parking problems occur with optical probes having a serial number 07L (Dec 07) or older, be sure the firmware is 3.06 or later. Parking issues with optical probes having a serial number prior to 07L may be related to a dirty wiper body or pad.

Record sonde battery voltage: N/A (if applicable)

Record the following diagnostic numbers after calibration.

6560 Conductivity cell constant 5.00117 Range 5.0 ± .45
Integrated conductivity cell constant _____ Range 5.0 ± .70
pH mv Buffer 7 _____ Range 0 ± 50 mv
pH mv Buffer 4 _____ Range +180 ± 50 mv*
pH mv Buffer 10 _____ Range -180 ± 50 mv *
***Note:** Millivolt span between pH 4 and 7 should be ≈ 165 to 180 mv
Millivolt span between pH 7 and 10 should be ≈ 165 to 180 mv
DO charge (RP only) _____ Range 25 to 75
DO gain _____ Range 0.7 to 1.4
ODO gain _____ Range 0.85 to 1.15

Turbidity standard used in calibration _____
Manufacturer and part number _____

Barometric Pressure: _____ mmHg
DO % Calculated – (BARO mmHg divided by 7.6) = % saturation
Example: 760 ÷ 7.6 = 100.0%

Record Calibration Values

	Standard	Pre Cal / Post Cal
Temperature	_____	___ Sonde
Conductivity	10 mS/cm	10.08/10
pH 7	_____	___/___
pH 4	_____	___/___
pH 10	_____	___/___
ORP	_____	___/___
Turbidity	_____	___/___
Turbidity	_____	___/___
Turbidity 0.5	_____	___/___
Chlorophyll	_____	___/___
Chlorophyll	_____	___/___
DO RP	_____	___/___
DO ROX	_____	___/___
BGA PE/PC	_____	___/___
BGA PE/PC	_____	___/___
Rhodamine	_____	___/___

Depth Calibration - If zero was entered, record barometric pressure at time of calibration _____ mmHg
Depth Calibration - If offset depth was entered, record value 0.2 (meters/feet and pressure 761.8 mmHg
Depth Calibration (Vented) – Acceptable calibration constant: 0.0 psig ± 0.15 _____

Notes:

amec

3500 188th Street SW, Suite 601, Lynnwood, WA 98037
(425) 921-4000

Job Number: L41116 0040 Date: 4/13 Page 1 of 1

Location: Slip 4 Salinity Monitoring By: RHG

0950	Launch boat
0930	Transect A light sprinkles calm <5 KTs Overcast
1022	Small boat travelled in and out of Slip 4 on South side during DPS 5 light rain
1037	Tug manuvering @ mouth of Slip 4
1055	Finish Round 1
1120	Start Round 2 @ DPS 1 light rain light winds - overcast
1130	Steady rain
1200	Stopped raining
1235	Finish Round 2 light rain
1320	Start Round 3 Occasional light rain light Winds
1340	steady rain wind gusts to 10 to 15
1450	Finish Round 3 No Rain
1525	Start Round 4 - heavy rain
1714	Finish Round 4 - no rain
1730	Start Round 5 no rain - some sun
1905	Finish Round 5 - ~~[illegible]~~ sprinkling
1930	Start Round 6 partial clearing occasional sprinkles
2055	Finished Round 6 - no rain

Fieldlog AMEC.XLS

AMEC Geomatrix, Inc., GPS Check Form

Date: 4/13/11

Project: Slip 4 Salinity Monitoring

Recorder: RHA

Calculated Location of Reference Station

Coordinate Datum: WA State Plane, NAD 83

Zone: North Zone

Reference Station Name: Check Point 1

Northing 196376

Easting 1274699

Units of Measure: Survey Feet

Reference Station Description: Piling at downstream end of the South Park Marina at the end of the channel side dock.

Start of Day

Time: 0915

Northing 196378

Coordinate Datum Setup Confirmed: Y/EG

Easting 1274698

Comments:

End of Day

Time: 1955

Northing [illegible]

Coordinate Datum Setup Confirmed:

Easting [illegible]

Comments:

CALIBRATION WORK SHEET

Date of Calibration: 4/12/11 Sonde ID: 6820-04J15529AA
Technician: R Gilmour

RP DO membrane changed? Y (N) *Note: Wait 3 to 6 hours before calibrating for unattended*
RP DO membrane o-ring changed? Y (N) *deployments; run in Discrete mode for 10 minutes to accelerate burn in. (Rapid Pulse DO Only)*

Turbidity wiper changed? Y (N) Chlorophyll wiper changed? Y (N)
ROX DO wiper changed? Y (N) BGA-PE wiper changed? Y (N)
BGA-PC wiper changed? Y (N) Rhodamine wiper changed? Y (N)

Note: If parking problems occur with optical probes having a serial number 07L (Dec 07) or older, be sure the firmware is 3.06 or later. Parking issues with optical probes having a serial number prior to 07L may be related to a dirty wiper body or pad.

Record sonde battery voltage: N/A (if applicable)

Record the following diagnostic numbers after calibration.

6560 Conductivity cell constant 5.00052 Range 5.0 ± .45
Integrated conductivity cell constant _____ Range 5.0 ± .70
pH mv Buffer 7 _____ Range 0 ± 50 mv
pH mv Buffer 4 _____ Range +180 ± 50 mv*
pH mv Buffer 10 _____ Range -180 ± 50 mv *

***Note:** Millivolt span between pH 4 and 7 should be ≈ 165 to 180 mv
Millivolt span between pH 7 and 10 should be ≈ 165 to 180 mv

DO charge (RP only) _____ Range 25 to 75
DO gain _____ Range 0.7 to 1.4
ODO gain _____ Range 0.85 to 1.15

Turbidity standard used in calibration _____
Manufacturer and part number _____

Barometric Pressure: _____ mmHg
DO % Calculated – (BARO mmHg divided by 7.6) = % saturation
Example: 760 ÷ 7.6 = 100.0%

Record Calibration Values

	Standard	Pre Cal / Post Cal
Temperature		22.0 Sonde
Conductivity	YSI 3168 10 mS/cm	10.001 / 10.00
pH 7		/
pH 4		/
pH 10		/
ORP		/
Turbidity		/
Turbidity		/
Turbidity 0.5		/
Chlorophyll		/
Chlorophyll		/
DO RP		/
DO ROX		/
BGA PE/PC		/
BGA PE/PC		/
Rhodamine		/

Depth Calibration - If zero was entered, record barometric pressure at time of calibration _____ mmHg
Depth Calibration - If offset depth was entered, record value 0.2 meters/feet and pressure _____ mmHg
Depth Calibration (Vented) – Acceptable calibration constant: 0.0 psig ± 0.15 _____

Notes: Depth Calibration

amec

3500 188th Street SW, Suite 601, Lynnwood, WA 98037
(425) 921-4000

Job Number: LY11160040 Date: 4/17/11 Page 1 of 1

Location: Slip 4 Duwamish By: RHG

0845	Launch boat @ 1st st Bridge.
0900	GPS check
0930	Starting 1st Round of monitoring Transect A
	Partially cloudy calm
1050	End Round 1 sunny calm
1130	Start Round 2.
1134	Discharge from storm sewer at head of slip
1258	End Round 2 occasional light breeze
1330	Begin Round 3 - sunny & calm - light breeze
1510	End Round 2 partly cloudy light breeze
1530	Begin Round 4 partly cloudy light breeze
1630	Tug leaving berth before we start DPS-6
1700	Halocline disturbed boundary less defined/shallower 710 ppt @ 2-2.5m
1730	Finished Round 4 - partly cloudy & light breeze
1734	Begin Round 5 " " " "
1835	Dropping profiler @ station 4 because of wind quit at last
1940	Finished Round 5 - partly cloudy & light breeze
1945	Start Final Round 6 partly cloudy light breeze
2140	End Round 6
2148	GPS Check

AMEC Geomatrix, Inc., GPS Check Form

Date: 4/17/11

Project: Slip 4 Salinity Monitoring

Recorder: RHG

Calculated Location of Reference Station

Coordinate Datum: WA State Plane, NAD 83

Zone: North Zone

Reference Station Name: Check Point 1

Northing 196376

Easting 1274699

Units of Measure: Survey Feet

Reference Station Description: Piling at downstream end of the South Park Marina at the end of the channel side dock.

Start of Day

Time: 0900

Northing 196378

Coordinate Datum Setup Confirmed: YES

Easting 1274699

Comments:

End of Day

Time: 940 PM

Northing 196379

Coordinate Datum Setup Confirmed: YES

Easting 1274699

Comments:

CALIBRATION WORK SHEET

Date of Calibration: 4/19/11 Sonde ID: 6E20-0415529AA
Technician: Rob Gilmour

RP DO membrane changed? Y (N)
RP DO membrane o-ring changed? Y (N)

Note: Wait 3 to 6 hours before calibrating for unattended deployments; run in Discrete mode for 10 minutes to accelerate burn in. (Rapid Pulse DO Only)

Turbidity wiper changed? Y (N) Chlorophyll wiper changed? Y (N)
ROX DO wiper changed? Y (N) BGA-PE wiper changed? Y (N)
BGA-PC wiper changed? Y (N) Rhodamine wiper changed? Y (N)

Note: If parking problems occur with optical probes having a serial number 07L (Dec 07) or older, be sure the firmware is 3.06 or later. Parking issues with optical probes having a serial number prior to 07L may be related to a dirty wiper body or pad.

Record sonde battery voltage: _____ (if applicable)

Record the following diagnostic numbers after calibration.

6560 Conductivity cell constant 50052 Range 5.0 ± .45
Integrated conductivity cell constant _____ Range 5.0 ± .70
pH mv Buffer 7 _____ Range 0 ± 50 mv
pH mv Buffer 4 _____ Range +180 ± 50 mv*
pH mv Buffer 10 _____ Range -180 ± 50 mv *

***Note:** Millivolt span between pH 4 and 7 should be ≈ 165 to 180 mv
Millivolt span between pH 7 and 10 should be ≈ 165 to 180 mv

DO charge (RP only) _____ Range 25 to 75
DO gain _____ Range 0.7 to 1.4
ODO gain _____ Range 0.85 to 1.15

Turbidity standard used in calibration _____
Manufacturer and part number _____

Barometric Pressure: _____ mmHg
DO % Calculated – (BARO mmHg divided by 7.6) = % saturation
Example: 760 ÷ 7.6 = 100.0%

Record Calibration Values

	Standard	Pre Cal / Post Cal
Temperature	_____	___ Sonde
Conductivity	10mS/cm	10 / 10.0
pH 7	_____	___/___
pH 4	_____	___/___
pH 10	_____	___/___
ORP	_____	___/___
Turbidity	_____	___/___
Turbidity	_____	___/___
Turbidity 0.5	_____	___/___
Chlorophyll	_____	___/___
Chlorophyll	_____	___/___
DO RP	_____	___/___
DO ROX	_____	___/___
BGA PE/PC	_____	___/___
BGA PE/PC	_____	___/___
Rhodamine	_____	___/___

Depth Calibration - If zero was entered, record barometric pressure at time of calibration _____ mmHg
Depth Calibration - If offset depth was entered, record value 0.2 meters/feet and pressure _____ mmHg
Depth Calibration (Vented) – Acceptable calibration constant: 0.0 psig ± 0.15 _____

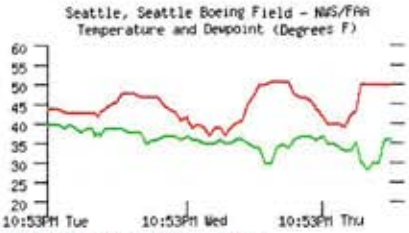
Notes:

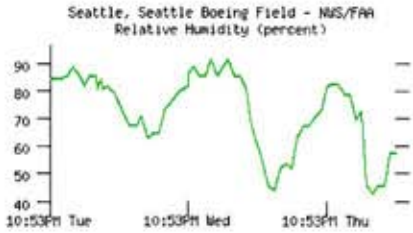
APPENDIX B

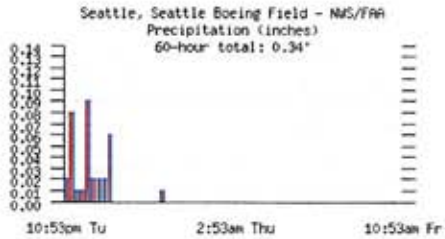
Seattle Boeing Field (KBFI) Weather Conditions

Close window Quick 60-Hour View

Show 7 Days Show Raw Observations For Information Regarding the Accuracy of This Data: MesoWest Disclaimer







Weather Conditions for:

Seattle, Seattle Boeing Field, WA (KBFI)

Elev: 16 ft, Latitude: 47.54583, Longitude: -122.31361

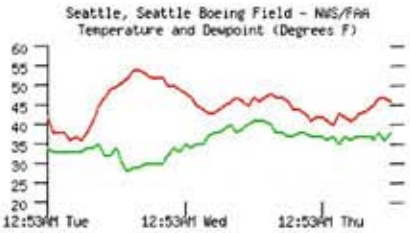
Current time: Fri, 18 Mar 11:35 am (PDT)

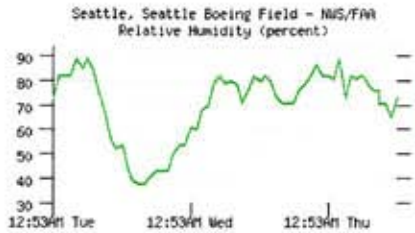
Most Recent Observation: Fri, 18 Mar 10:53 am (PDT)

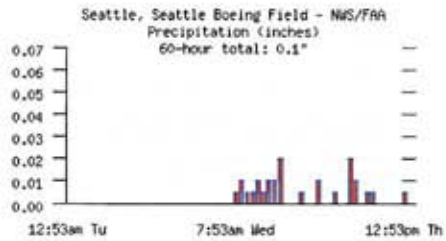
Time (PDT)	Temp. (f)	Dew Point (f)	Relative Humidity (%)	Wind Chill (f)	Wind Direction	Wind Speed (mph)	Visibility (miles)	WX	Clouds	Sea Level Pressure (mb)	Altimeter Setting (inches)	Station Pressure (inches)	Precip 1 hour (inches)	Precip 3 hour (inches)	Precip 6 hour (inches)	Precip 24 hour (inches)	6 Hr Max Temp	6 Hr Min Temp	24 Hr Max Temp	24 Hr Min Temp	Quality Control
18 Mar 10:53 am	50	36	58		SSE	7	10.00		BKN043 OVC055	1008.5	29.78	29.772					52	43			OK
18 Mar 9:53 am	50	36	58		CALM		10.00		BKN060 OVC110	1007.9	29.77	29.762									OK
18 Mar 8:53 am	50	30	46		S	6	10.00		BKN055 OVC075	1007.9	29.77	29.762									OK
18 Mar 7:53 am	50	30	46		ESE	12	10.00		OVC090	1007.6	29.76	29.752									OK
18 Mar 6:53 am	50	28	43		SE	16G21	10.00		BKN080 OVC095	1008.1	29.77	29.762									OK
18 Mar 5:53 am	50	30	46		ESE	10	10.00		BKN090 OVC110	1008.3	29.78	29.772									OK
18 Mar 4:53 am	43	35	73		NNW	5	10.00		BKN090 OVC100	1008.8	29.79	29.782					45	38			OK
18 Mar 3:53 am	42	33	70		CALM		10.00		BKN090 OVC110	1009.8	29.82	29.812									OK
18 Mar 2:53 am	39	33	79		CALM		10.00		SCT110	1010.8	29.85	29.842									OK
18 Mar 1:53 am	40	34	79		CALM		10.00		CLR	1011.4	29.87	29.862									OK
18 Mar 12:53 am	40	35	83		CALM		10.00		CLR	1012.6	29.90	29.892							52	36	OK
17 Mar 11:53 pm	40	35	83		CALM		10.00		SCT085	1013.5	29.93	29.922									OK
17 Mar 10:53 pm	42	37	82		CALM		10.00		OVC090	1014.1	29.95	29.942					51	42			OK
17 Mar 9:53 pm	44	36	73		CALM		10.00		FEW100	1014.5	29.96	29.952									OK
17 Mar 8:53 pm	46	37	71		CALM		10.00		BKN065 OVC080	1014.6	29.96	29.952									OK
17 Mar 7:53 pm	47	37	68		CALM		10.00		FEW070	1014.7	29.97	29.962									OK
17 Mar 6:53 pm	47	37	68		SE	3	10.00		SCT090 SCT110	1015.0	29.97	29.962									OK
17 Mar 5:53 pm	48	36	63		S	8	10.00		OVC048	1015.6	29.99	29.982									OK
17 Mar 4:53 pm	51	34	52		S	5	10.00		SCT060	1015.5	29.99	29.982					52	47			OK
17 Mar 3:53 pm	51	35	54		SW	9	10.00		BKN060 OVC075	1015.9	30.00	29.992									OK
17 Mar 2:53 pm	51	34	52		S	6G16	10.00		FEW055 BKN070 BKN095	1015.9	30.00	29.992									OK
17 Mar 1:53 pm	51	30	44		S	8	10.00		BKN060 OVC095	1016.0	30.01	30.002									OK
17 Mar 12:53 pm	50	30	46		S	7	10.00		FEW065 SCT095	1016.9	30.03	30.022									OK
17 Mar 11:53 am	50	34	54		CALM		10.00		FEW044 SCT070	1017.4	30.05	30.041									OK
17 Mar 10:53 am	47	34	60		SE	7	10.00		SCT080	1017.9	30.06	30.051					47	37			OK
17 Mar 9:53 am	45	35	68		ESE	5	10.00		FEW030 SCT100	1018.3	30.07	30.061									OK
17 Mar 8:53 am	41	36	81		ESE	3	10.00		SCT043	1018.3	30.07	30.061									OK
17 Mar 7:53 am	40	36	86		CALM		10.00		BKN039	1018.4	30.08	30.071									OK
17 Mar 6:53 am	39	35	86		ESE	5	10.00		BKN060	1018.5	30.08	30.071									OK
17 Mar 5:53 am	37	35	92		SE	6	10.00		FEW016 SCT070 BKN095	1018.7	30.09	30.081									OK
17 Mar 4:53 am	39	36	89		CALM		10.00		FEW020 BKN050	1018.7	30.08	30.071				0.09	42	36			OK
17 Mar 3:53 am	39	35	86		SE	6	10.00		FEW044	1018.7	30.08	30.071									OK
17 Mar 2:53 am	37	35	92		SE	6	10.00		SCT030	1018.8	30.09	30.081									OK
17 Mar 1:53 am	39	35	86	33	SSE	9	10.00		FEW020 BKN090	1018.5	30.08	30.071									OK
17 Mar 12:53 am	40	36	86		S	7	10.00		FEW020 BKN095	1018.3	30.07	30.061							50	39	OK
16 Mar 11:53 pm	39	36	89		SSE	7	10.00		FEW025	1018.1	30.07	30.061									OK
16 Mar 11:00 pm	41	37	87		SSE	9	10.00		FEW018 BKN028		30.06	30.051									OK
16 Mar 10:53 pm	42	37	82		SSE	9	10.00		FEW020 BKN030	1017.9	30.06	30.051					47	40			OK
16 Mar 9:53 pm	41	36	81		S	9	10.00		CLR	1017.3	30.04	30.032									OK
16 Mar 8:53 pm	43	37	79		SSE	12	10.00		CLR	1016.6	30.02	30.012									OK
16 Mar 7:53 pm	44	37	76		S	12G21	10.00		SCT020 BKN150	1016.0	30.00	29.992									OK
16 Mar 6:53 pm	45	37	74		S	12	10.00		FEW048 SCT090	1015.2	29.98	29.972									OK
16 Mar 5:53 pm	47	36	65		S	10G16	10.00		FEW030 SCT090 BKN200	1014.5	29.96	29.952									OK
16 Mar 4:53 pm	47	36	65		S	14G25	10.00		SCT085 OVC200	1013.7	29.94	29.932			0.01		50	46			OK
16 Mar 3:53 pm	47	35	63		SSW	9G18	10.00		SCT065 OVC200	1013.0	29.92	29.912									OK
16 Mar 2:53 pm	47	38	71		S	12G20	10.00		FEW029 SCT090	1012.5	29.90	29.892									OK
16 Mar 1:53 pm	48	38	68		SSW	13	10.00		FEW027 SCT035	1012.2	29.89	29.882	0.01								OK
16 Mar 12:53 pm	48	38	68		SSW	10G17	10.00		SCT032 BKN200	1011.7	29.88	29.872									OK
16 Mar 11:53 am	48	39	71		SSW	9G16	10.00		SCT012 SCT030 BKN080	1011.3	29.87	29.862									OK
16 Mar 10:53 am	46	39	76		S	12	10.00		FEW019 BKN200	1011.3	29.87	29.862			0.08		47	42			OK
16 Mar 9:53 am	45	39	80		S	9	10.00		SCT022 BKN060	1010.9	29.85	29.842									OK
16 Mar 8:53 am	44	39	82		SSE	9	10.00		FEW018 SCT029 BKN095	1010.3	29.84	29.832									OK
16 Mar 8:00 am	43	37	81		SE	12	10.00		SCT025 BKN060		29.82	29.812									OK
16 Mar 7:53 am	42	38	85		SSE	9	10.00		BKN025 BKN120	1009.7	29.82	29.812		0.08							OK
16 Mar 7:13 am	43	37	81		SSE	10	10.00		BKN023 BKN031 BKN038		29.81	29.802									OK
16 Mar 7:06 am	43	37	81		SSE	10G16	10.00		FEW021 SCT027		29.81	29.802									OK
16 Mar 6:53 am	43	39	86		S	3	10.00		BKN023 BKN031 BKN038	1009.3	29.81	29.802	0.06								OK
16 Mar 5:53 am	43	39	86		S	14	7.00	-RA	BKN026 OVC041	1009.2	29.80	29.792	0.02								OK
16 Mar 4:53 am	43	38	82		S	12G22	10.00	-RA	SCT027 BKN036 OVC043	1008.9	29.80	29.792	0.02			0.48	45	42			OK
16 Mar 3:53 am	43	39	86		S	14	10.00	-RA	SCT034 BKN046 BKN100	1008.6	29.79	29.782	0.02								OK
16 Mar 2:53 am	43	40	89		S	13	10.00	-RA	SCT017 BKN022 OVC028	1008.6	29.79	29.782	0.09								OK
16 Mar 1:53 am	43	39	86		S	13G21	9.00	-RA	SCT024 BKN041 OVC048	1008.0	29.77	29.762	0.01								OK
16 Mar 12:53 am	44	40	85		SSE	16G24	8.00	-RA	SCT022 BKN031 OVC039	1007.3	29.75	29.742	0.01								OK
15 Mar 11:53 pm	44	40	85		SSE	14G20	10.00	-RA	FEW026 BKN050 OVC060	1006.5	29.72	29.712	0.08								OK

Close window Quick 60-Hour View

Show 7 Days Show Raw Observations For Information Regarding the Accuracy of This Data: MesoWest Disclaimer







Weather Conditions for:

Seattle, Seattle Boeing Field, WA (KBFI)

Elev. 16 ft, Latitude: 47.54583; Longitude: -122.31361

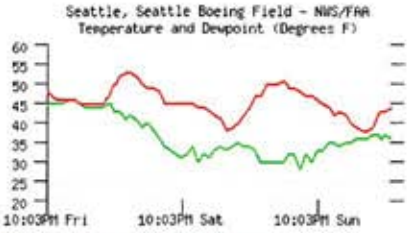
Current time: Thu, 14 Apr 1:11 pm (PDT)

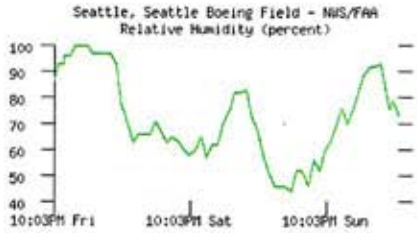
Most Recent Observation: Thu, 14 Apr 12:53 pm (PDT)

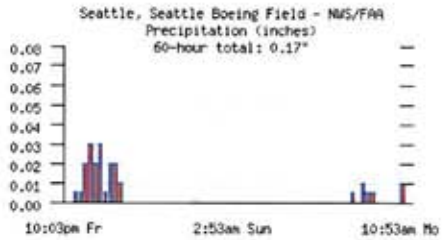
Time (PDT)	Temp. (f)	Dew Point (f)	Relative Humidity (%)	Wind Direction	Wind Speed (mph)	Visibility (miles)	WX	Clouds	Sea Level Pressure (mb)	Altimeter Setting (inches)	Station Pressure (inches)	Precip 1 hour (inches)	Precip 3 hour (inches)	Precip 6 hour (inches)	Precip 24 hour (inches)	6 Hr Max Temp	6 Hr Min Temp	24 Hr Max Temp	24 Hr Min Temp	Quality Control
14 Apr 12:53 pm	46	38	73	SSE	10	10.00	-RA	OVC034	1020.5	30.14	30.131	T								OK
14 Apr 11:53 am	47	36	65	S	9G16	10.00		SCT035 OVC180	1021.0	30.15	30.141									OK
14 Apr 10:53 am	47	38	71	SSE	8	10.00		FEW046 BKN065	1021.8	30.18	30.171			0.01		47	41			OK
14 Apr 9:53 am	45	36	71	S	9	10.00		BKN024 BKN033 OVC046	1021.9	30.18	30.171									OK
14 Apr 9:49 am	45	37	76	S	9G18	10.00		BKN024 BKN033 BKN049		30.18	30.171									OK
14 Apr 8:53 am	44	37	76	S	12	10.00		OVC037	1021.7	30.17	30.161									OK
14 Apr 7:53 am	43	37	79	S	12G17	10.00		OVC041	1021.0	30.15	30.141	T	0.01							OK
14 Apr 7:24 am	43	37	81	S	8	10.00		SCT023 SCT028 OVC034		30.16	30.151	T								OK
14 Apr 6:53 am	42	37	82	SSE	7	10.00		BKN024 OVC033	1020.7	30.15	30.141									OK
14 Apr 5:53 am	41	36	81	SSE	12	10.00		SCT022 SCT028 BKN039	1020.0	30.12	30.111	0.01								OK
14 Apr 4:53 am	42	37	82	SE	8	10.00		SCT022 BKN030 OVC050	1019.5	30.11	30.101	0.02			0.09	43	40			OK
14 Apr 3:53 am	43	35	73	S	12G23	10.00		SCT020 BKN039 OVC060	1019.7	30.11	30.101									OK
14 Apr 2:53 am	40	37	89	SSE	7	10.00		SCT050 BKN080	1019.5	30.11	30.101									OK
14 Apr 1:53 am	41	36	81	SSE	10	10.00		BKN024 BKN032 BKN100	1019.9	30.12	30.111	T								OK
14 Apr 12:53 am	42	37	82	SSE	8	10.00		BKN024 BKN041 BKN090	1019.8	30.12	30.111							49	41	OK
13 Apr 11:53 pm	42	37	82	S	13	10.00		FEW022 SCT045 BKN110	1019.1	30.10	30.091									OK
13 Apr 10:53 pm	41	37	87	SSE	9	10.00		FEW018 SCT029 BKN095	1018.6	30.08	30.071	0.01				47	41			OK
13 Apr 9:53 pm	43	38	82	S	8	10.00		FEW039 SCT047 BKN075	1018.2	30.07	30.061									OK
13 Apr 8:53 pm	44	38	79	SSE	10	10.00		SCT060	1017.8	30.06	30.051									OK
13 Apr 7:53 pm	44	37	76	SSE	8	10.00		FEW033 SCT050	1017.0	30.03	30.022	T								OK
13 Apr 6:53 pm	46	37	71	SSE	15G20	10.00		SCT040 BKN060	1016.5	30.02	30.012									OK
13 Apr 5:53 pm	47	38	71	SSE	13G18	10.00		SCT050 OVC100	1016.2	30.01	30.002									OK
13 Apr 4:53 pm	47	38	71	S	13G20	10.00		SCT030 OVC060	1016.0	30.00	29.992			0.05		48	45			OK
13 Apr 3:53 pm	48	40	73	S	9	10.00		FEW042 SCT080 BKN100	1015.2	29.98	29.972	0.02								OK
13 Apr 2:53 pm	47	41	80	S	9	10.00		SCT022 BKN043 OVC060	1014.8	29.96	29.952	0.01								OK
13 Apr 1:53 pm	46	41	82	S	10G23	9.00	-RA	SCT022 BKN043 BKN060	1014.2	29.95	29.942	0.01								OK
13 Apr 12:53 pm	47	41	80	SSW	13	10.00	-RA	FEW031 BKN043 BKN060	1013.6	29.94	29.932	T								OK
13 Apr 11:53 am	45	40	82	S	9	10.00	-RA	FEW020 OVC038	1013.5	29.93	29.922	0.01								OK
13 Apr 10:53 am	46	39	76	SSW	5	10.00	-RA	OVC041	1013.4	29.93	29.922	T		0.01		47	42			OK
13 Apr 9:53 am	47	38	71	SW	6	10.00		SCT039 OVC049	1013.1	29.92	29.912	T								OK
13 Apr 8:53 am	46	40	79	SSE	7	10.00		BKN040 OVC065	1012.8	29.91	29.902	0.01								OK
13 Apr 7:53 am	45	39	80	SE	6	10.00	-RA	OVC041	1012.7	29.91	29.902	T								OK
13 Apr 6:53 am	44	38	79	SSE	7	10.00		BKN048 OVC060	1012.5	29.90	29.892									OK
13 Apr 5:53 am	43	38	82	SE	5	10.00		FEW060 BKN080	1012.5	29.90	29.892									OK
13 Apr 4:53 am	43	37	79	SE	7	10.00		FEW060 BKN080	1012.6	29.91	29.902					50	43			OK
13 Apr 3:53 am	44	35	70	SE	3	10.00		FEW035 OVC120	1012.9	29.91	29.902									OK
13 Apr 2:53 am	45	35	68	CALM		10.00		FEW040 OVC120	1013.1	29.92	29.912									OK
13 Apr 1:53 am	47	34	60	CALM		10.00		CLR	1013.3	29.93	29.922									OK
13 Apr 12:53 am	48	35	61	ESE	5	10.00		SCT075 BKN090	1013.5	29.93	29.922							55	35	OK
12 Apr 11:53 pm	49	33	54	E	3	10.00		OVC100	1013.9	29.94	29.932									OK
12 Apr 10:53 pm	50	34	54	E	3	10.00		BKN110	1014.4	29.96	29.952					54	49			OK
12 Apr 9:53 pm	50	32	50	SE	3	10.00		OVC110	1014.8	29.97	29.962									OK
12 Apr 8:53 pm	52	30	43	CALM		10.00		SCT120	1015.3	29.98	29.972									OK
12 Apr 7:53 pm	52	30	43	CALM		10.00		SCT110	1015.4	29.99	29.982									OK
12 Apr 6:53 pm	52	30	43	VRBL	3	10.00		FEW110 OVC200	1015.4	29.99	29.982									OK
12 Apr 5:53 pm	53	30	41	W	6	10.00		OVC200	1015.9	30.00	29.992									OK
12 Apr 4:53 pm	54	29	38	WSW	8	10.00		BKN180	1016.4	30.02	30.012					55	46			OK
12 Apr 3:53 pm	54	29	38	W	8	10.00		SCT200	1017.0	30.03	30.022									OK
12 Apr 2:53 pm	52	28	39	VRBL	6	10.00		SCT200	1017.8	30.06	30.051									OK
12 Apr 1:53 pm	51	30	44	VRBL	3	10.00		BKN250	1018.7	30.08	30.071									OK
12 Apr 12:53 pm	50	34	54	VRBL	6	10.00		FEW060 BKN180	1019.5	30.11	30.101									OK
12 Apr 11:53 am	49	32	52	CALM		10.00		FEW040 BKN200	1020.4	30.13	30.121									OK
12 Apr 10:53 am	47	32	56	CALM		10.00		FEW040 OVC200	1021.1	30.15	30.141					48	35			OK
12 Apr 9:53 am	45	35	68	CALM		10.00		CLR	1021.7	30.17	30.161									OK
12 Apr 8:53 am	41	34	75	CALM		10.00		BKN200	1022.3	30.19	30.181									OK
12 Apr 7:53 am	38	34	85	SSE	5	10.00		BKN200	1022.6	30.20	30.191									OK
12 Apr 6:53 am	36	33	89	SSE	6	10.00		OVC200	1023.0	30.21	30.201									OK
12 Apr 5:53 am	37	33	85	SE	5	10.00		OVC150	1023.5	30.23	30.221									OK
12 Apr 4:53 am	36	33	89	SE	5	10.00		CLR	1023.7	30.23	30.221					43	36			OK
12 Apr 3:53 am	38	33	82	ESE	5	10.00		CLR	1024.4	30.25	30.241									OK
12 Apr 2:53 am	38	33	82	SE	6	10.00		CLR	1024.8	30.27	30.261									OK
12 Apr 1:53 am	38	33	82	SE	7	10.00		CLR	1025.2	30.28	30.271									OK

Close window Quick 60-Hour View

Show 7 Days Show Raw Observations For Information Regarding the Accuracy of This Data: MesoWest Disclaimer







Weather Conditions for:

Seattle, Seattle Boeing Field, WA (KBFI)

Elev 16 ft, Latitude 47.54583; Longitude -122.31361

Current time: Mon, 18 Apr 10:58 am (PDT)

Most Recent Observation: Mon, 18 Apr 10:53 am (PDT)

Time (PDT)	Temp. (f)	Dew Point (f)	Relative Humidity (%)	Wind Direction	Wind Speed (mph)	Visibility (miles)	WX	Clouds	Sea Level Pressure (mb)	Altimeter Setting (inches)	Station Pressure (inches)	Precip 1 hour (inches)	Precip 3 hour (inches)	Precip 6 hour (inches)	Precip 24 hour (inches)	6 Hr Max Temp	6 Hr Min Temp	24 Hr Max Temp	24 Hr Min Temp	Quality Control
18 Apr 10:53 am	44	36	73	W	3	10.00		SCT020 BKN044	1018.2	30.07	30.061	0.01				44	37			OK
18 Apr 9:53 am	43	37	79	SSW	8	10.00		SCT020 OVC044	1017.9	30.06	30.051									OK
18 Apr 9:19 am	43	36	76	WSW	7	10.00		SCT018 BKN042 BKN049		30.05	30.041									OK
18 Apr 9:08 am	43	36	76	WSW	6	10.00		BKN016 BKN042 BKN048		30.05	30.041									OK
18 Apr 8:53 am	43	37	79	SSW	5	10.00		SCT016 SCT050	1017.4	30.05	30.041									OK
18 Apr 7:53 am	39	37	93	SE	6	10.00		SCT055	1016.9	30.03	30.022		T							OK
18 Apr 6:53 am	38	36	92	CALM		10.00		FEW045 SCT070	1016.3	30.02	30.012	T								OK
18 Apr 5:53 am	38	36	92	SE	5	10.00		BKN031 BKN055 OVC075	1016.0	30.01	30.002	T								OK
18 Apr 4:53 am	39	36	89	E	3	10.00		SCT022 BKN036 OVC075	1016.1	30.01	30.002	0.01			0.01	45	39			OK
18 Apr 3:53 am	40	35	83	ESE	3	10.00		FEW024 SCT036 BKN050	1016.1	30.01	30.002									OK
18 Apr 2:53 am	42	35	76	CALM		10.00		SCT026 BKN060 OVC080	1016.1	30.01	30.002	T								OK
18 Apr 1:53 am	43	34	70	ENE	5	10.00		BKN028 OVC100	1015.9	30.00	29.992									OK
18 Apr 12:53 am	42	35	76	CALM		10.00		OVC095	1016.1	30.01	30.002							53	37	OK
17 Apr 11:53 pm	44	35	70	CALM		10.00		OVC100	1015.9	30.00	29.992									OK
17 Apr 10:53 pm	45	33	63	CALM		10.00		SCT050 OVC100	1015.8	30.00	29.992					50	45			OK
17 Apr 9:53 pm	46	33	60	VRBL	5	10.00		OVC100	1015.8	30.00	29.992									OK
17 Apr 8:53 pm	47	30	52	CALM		10.00		OVC110	1015.5	29.99	29.982									OK
17 Apr 7:53 pm	47	32	56	VRBL	3	10.00		SCT060 BKN090	1015.4	29.99	29.982									OK
17 Apr 6:53 pm	48	28	46	NNW	7	10.00		BKN090 OVC200	1015.7	30.00	29.992									OK
17 Apr 5:53 pm	49	32	52	NNW	9	10.00		SCT040 OVC090	1016.1	30.01	30.002									OK
17 Apr 4:53 pm	49	32	52	W	8	10.00		SCT090	1016.2	30.01	30.002					53	46			OK
17 Apr 3:53 pm	51	30	44	NW	8	10.00		SCT055 BKN075	1016.4	30.02	30.012									OK
17 Apr 2:53 pm	50	30	46	CALM		10.00		BKN040	1016.6	30.02	30.012									OK
17 Apr 1:53 pm	50	30	46	CALM		10.00		BKN060	1017.0	30.03	30.022									OK
17 Apr 12:53 pm	50	30	46	VRBL	3	10.00		SCT050	1017.8	30.06	30.051									OK
17 Apr 11:53 am	47	30	52	CALM		10.00		SCT044 OVC060	1018.0	30.06	30.051									OK
17 Apr 10:53 am	47	33	58	SE	6	10.00		SCT036 SCT046	1018.4	30.08	30.071					47	37			OK
17 Apr 9:53 am	44	34	67	SE	3	10.00		BKN041	1018.5	30.08	30.071									OK
17 Apr 8:53 am	42	34	73	S	7	10.00		BKN041 BKN050	1018.7	30.09	30.081									OK
17 Apr 7:53 am	40	35	83	CALM		10.00		BKN043 OVC060	1018.8	30.09	30.081									OK
17 Apr 6:53 am	39	34	82	VRBL	3	10.00		BKN046	1018.6	30.08	30.071									OK
17 Apr 5:53 am	38	33	82	SE	3	10.00		BKN055	1018.0	30.07	30.061									OK
17 Apr 4:53 am	41	34	75	CALM		10.00		SCT038 BKN050 OVC080	1017.9	30.06	30.051				0.03	45	40			OK
17 Apr 3:53 am	42	33	70	S	7	10.00		BKN060 OVC080	1017.7	30.06	30.051									OK
17 Apr 2:53 am	43	31	62	ENE	3	10.00		OVC080	1017.8	30.06	30.051									OK
17 Apr 1:53 am	44	32	62	CALM		10.00		OVC085	1018.0	30.06	30.051									OK
17 Apr 12:53 am	44	30	57	N	5	10.00		OVC080	1018.0	30.06	30.051							54	44	OK
16 Apr 11:53 pm	45	34	65	N	3	10.00		OVC060	1017.8	30.06	30.051									OK
16 Apr 10:53 pm	45	32	60	VRBL	3	10.00		BKN047 OVC060	1017.5	30.05	30.041					50	44			OK
16 Apr 9:53 pm	45	31	58	CALM		10.00		BKN032 OVC043	1017.7	30.06	30.051									OK
16 Apr 8:53 pm	45	32	60	VRBL	5	10.00		OVC043	1017.6	30.05	30.041									OK
16 Apr 7:53 pm	45	33	63	VRBL	5	10.00		BKN038	1016.9	30.03	30.022									OK
16 Apr 6:53 pm	45	34	65	NNE	9G16	10.00		BKN038	1016.8	30.03	30.022									OK
16 Apr 5:53 pm	48	36	63	N	10G18	10.00		SCT032	1016.8	30.03	30.022									OK
16 Apr 4:53 pm	49	38	66	NNE	9	10.00		SCT041	1016.9	30.03	30.022					54	48			OK
16 Apr 3:53 pm	49	40	71	NNE	10G17	10.00		FEW032 SCT043 BKN075	1017.0	30.04	30.032									OK
16 Apr 2:53 pm	50	39	66	NE	7	10.00		BKN023 OVC031	1017.1	30.04	30.032									OK
16 Apr 1:53 pm	52	41	66	WNW	7	10.00		SCT031 BKN049	1016.8	30.03	30.022									OK
16 Apr 12:53 pm	53	42	66	VRBL	6	10.00		SCT031 BKN049	1016.6	30.02	30.012									OK
16 Apr 11:53 am	53	41	63	S	12	10.00		SCT049	1016.5	30.02	30.012									OK
16 Apr 10:53 am	52	43	71	S	9	10.00		FEW025	1016.3	30.01	30.002			0.03		52	44			OK
16 Apr 10:08 am	50	43	76	WSW	7	10.00		FEW006 BKN018		30.02	30.012									OK
16 Apr 10:00 am	50	43	76	WSW	8	10.00		CLR		30.02	30.012									OK
16 Apr 9:53 am	50	43	76	WSW	8	10.00		FEW006 BKN018	1016.6	30.02	30.012									OK
16 Apr 9:07 am	48	45	87	SW	6	10.00		SCT006 BKN012		30.02	30.012									OK
16 Apr 8:53 am	47	45	93	S	5	10.00		BKN008	1016.5	30.02	30.012									OK
16 Apr 7:53 am	45	44	97	CALM		8.00		OVC008	1016.7	30.03	30.022		0.03							OK
16 Apr 6:53 am	45	44	97	CALM		6.00	BR	BKN004 OVC006	1016.3	30.01	30.002	0.01								OK
16 Apr 5:53 am	45	44	97	CALM		2.00	-RA BR	BKN004 OVC011	1016.0	30.01	30.002	0.02								OK
16 Apr 4:53 am	45	44	97	NW	3	2.50	BR	OVC004	1015.8	30.00	29.992	0.02			0.14	47	45			OK
16 Apr 4:00 am	45	45	100	CALM		2.00	-RA BR	OVC004		29.99	29.982	T								OK
16 Apr 3:53 am	45	45	100	CALM		2.00	BR	BKN004 OVC009	1015.3	29.99	29.982	0.03								OK
16 Apr 2:53 am	46	46	100	CALM		1.75	BR	BKN005 OVC011	1015.3	29.98	29.972	0.02								OK
16 Apr 1:53 am	46	46	100	NW	3	2.50	-RA BR	OVC005	1015.2	29.98	29.972	0.03								OK
16 Apr 12:53 am	46	45	96	CALM		2.50	-RA BR	BKN005 OVC008	1014.9	29.97	29.962	0.02								Caution
15 Apr 11:53 pm	46	45	96	NW	3	4.00	BR	OVC008	1014.8	29.97	29.962	T								OK
15 Apr 11:43 pm	46	45	93	CALM		5.00	BR	OVC008		29.97	29.962	T								OK

APPENDIX C

Tide Charts Duwamish Waterway, 8th Avenue South

Tides:Duwamish Waterway, Eighth Ave. South

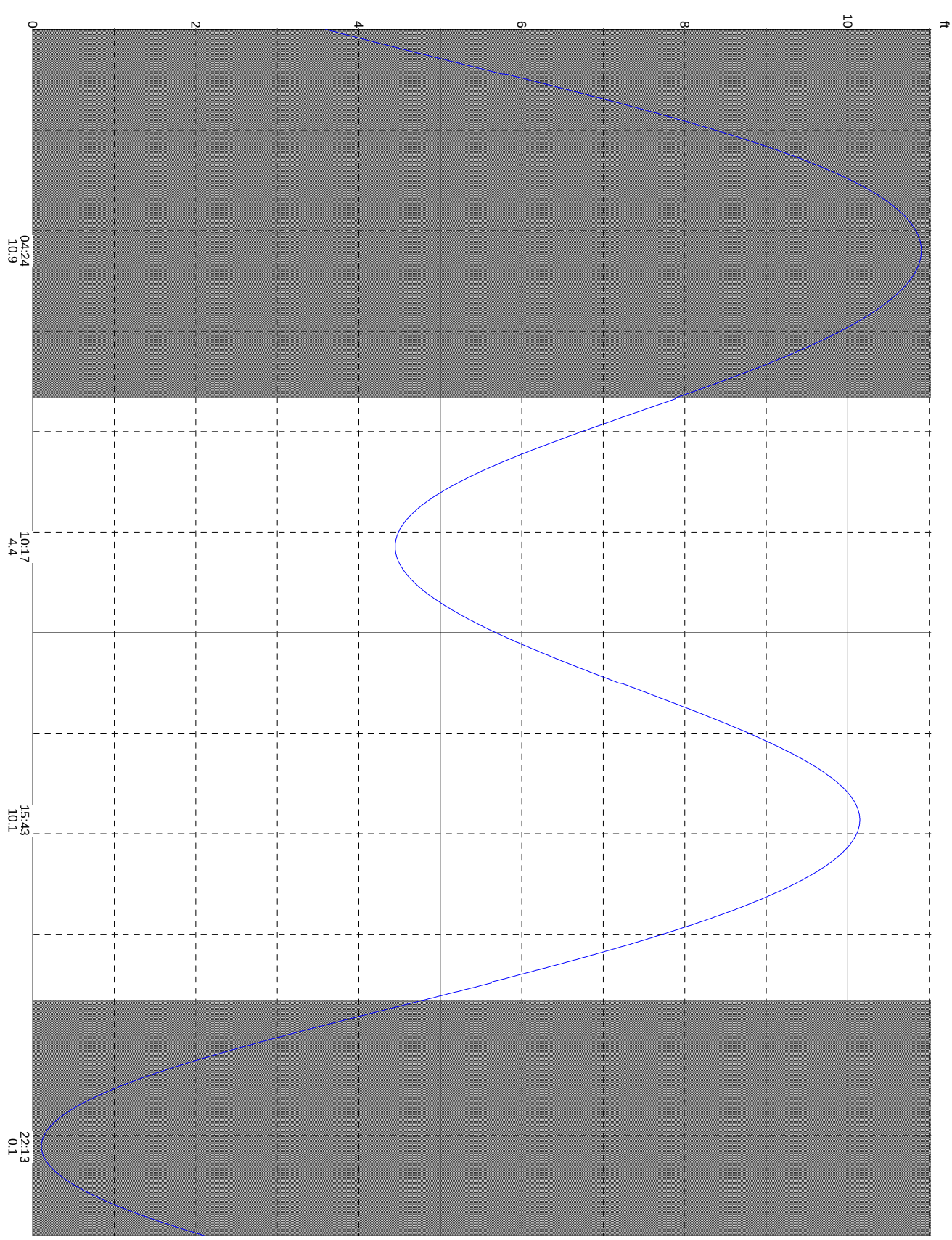
based on Seattle (Madison St), Elliot Bay Washington (NOAA)
47° 32 06 N 122° 19 18 W

Thursday, March 17, 2011

Average Tides	
Mean Range:	7.5 ft
MHHW:	11.1 ft
Mean Tide:	6.4 ft

Daily Highs & Lows		
04:24	10.9 ft	High
10:17	4.4 ft	Low
15:43	10.1 ft	High
22:13	0.1 ft	Low

(PDT)	Tide
00:00	3.6 ft
00:15	4.2 ft
00:30	4.8 ft
00:45	5.4 ft
01:00	6.1 ft
01:15	6.7 ft
01:30	7.3 ft
01:45	7.8 ft
02:00	8.4 ft
02:15	8.9 ft
02:30	9.3 ft
02:45	9.7 ft
03:00	10.0 ft
03:15	10.3 ft
03:30	10.5 ft
03:45	10.7 ft
04:00	10.8 ft
04:15	10.9 ft
04:30	10.9 ft
04:45	10.9 ft
05:00	10.8 ft
05:15	10.6 ft
05:30	10.4 ft
05:45	10.2 ft
06:00	9.9 ft
06:15	9.6 ft
06:30	9.2 ft
06:45	8.9 ft
07:00	8.5 ft
07:15	8.0 ft
07:30	7.6 ft
07:45	7.2 ft
08:00	6.7 ft
08:15	6.3 ft
08:30	5.9 ft
08:45	5.6 ft
09:00	5.2 ft
09:15	5.0 ft
09:30	4.7 ft
09:45	4.6 ft
10:00	4.5 ft
10:15	4.4 ft
10:30	4.5 ft
10:45	4.5 ft
11:00	4.7 ft
11:15	4.9 ft
11:30	5.1 ft
11:45	5.4 ft
12:00	5.7 ft
12:15	6.0 ft
12:30	6.4 ft
12:45	6.8 ft
13:00	7.2 ft
13:15	7.6 ft
13:30	8.0 ft
13:45	8.4 ft
14:00	8.8 ft
14:15	9.1 ft
14:30	9.4 ft
14:45	9.7 ft
15:00	9.9 ft
15:15	10.0 ft
15:30	10.1 ft
15:45	10.1 ft
16:00	10.1 ft
16:15	10.0 ft
16:30	9.8 ft
16:45	9.6 ft
17:00	9.3 ft
17:15	9.0 ft
17:30	8.6 ft
17:45	8.2 ft
18:00	7.7 ft
18:15	7.2 ft
18:30	6.7 ft
18:45	6.1 ft
19:00	5.5 ft
19:15	4.9 ft
19:30	4.3 ft
19:45	3.7 ft
20:00	3.1 ft
20:15	2.6 ft
20:30	2.0 ft
20:45	1.5 ft
21:00	1.1 ft
21:15	0.7 ft
21:30	0.5 ft
21:45	0.3 ft
22:00	0.1 ft
22:15	0.1 ft
22:30	0.2 ft
22:45	0.3 ft
23:00	0.5 ft
23:15	0.8 ft
23:30	1.2 ft
23:45	1.6 ft
00:00	2.1 ft



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Tides:Duwamish Waterway, Eighth Ave. South

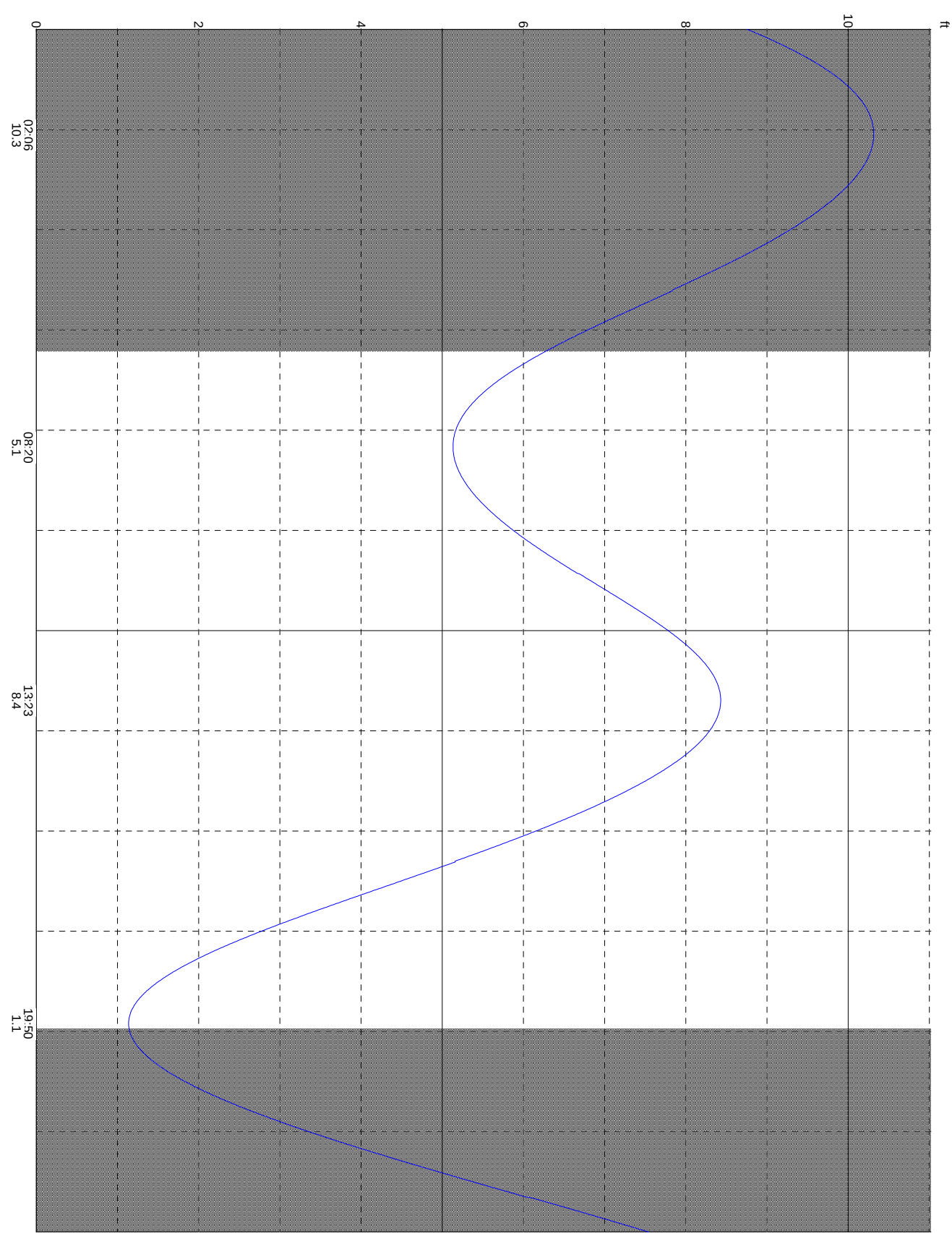
based on Seattle (Madison St), Elliot Bay Washington (NOAA)
47° 32 06 N 122° 19 18 W

Wednesday, April 13, 2011

Average Tides	
Mean Range:	7.5 ft
MHHW:	11.1 ft
Mean Tide:	6.4 ft

Daily Highs & Lows		
02:06	10.3 ft	High
08:20	5.1 ft	Low
13:23	8.4 ft	High
19:50	1.1 ft	Low

(PDT)	Tide
00:00	8.8 ft
00:15	9.1 ft
00:30	9.4 ft
00:45	9.7 ft
01:00	9.9 ft
01:15	10.1 ft
01:30	10.2 ft
01:45	10.3 ft
02:00	10.3 ft
02:15	10.3 ft
02:30	10.3 ft
02:45	10.2 ft
03:00	10.1 ft
03:15	9.9 ft
03:30	9.7 ft
03:45	9.5 ft
04:00	9.3 ft
04:15	9.0 ft
04:30	8.7 ft
04:45	8.4 ft
05:00	8.1 ft
05:15	7.8 ft
05:30	7.5 ft
05:45	7.1 ft
06:00	6.8 ft
06:15	6.5 ft
06:30	6.2 ft
06:45	5.9 ft
07:00	5.7 ft
07:15	5.5 ft
07:30	5.4 ft
07:45	5.2 ft
08:00	5.2 ft
08:15	5.1 ft
08:30	5.1 ft
08:45	5.2 ft
09:00	5.3 ft
09:15	5.4 ft
09:30	5.5 ft
09:45	5.7 ft
10:00	5.9 ft
10:15	6.1 ft
10:30	6.3 ft
10:45	6.6 ft
11:00	6.8 ft
11:15	7.1 ft
11:30	7.3 ft
11:45	7.6 ft
12:00	7.8 ft
12:15	8.0 ft
12:30	8.1 ft
12:45	8.3 ft
13:00	8.4 ft
13:15	8.4 ft
13:30	8.4 ft
13:45	8.4 ft
14:00	8.3 ft
14:15	8.2 ft
14:30	8.0 ft
14:45	7.8 ft
15:00	7.5 ft
15:15	7.2 ft
15:30	6.9 ft
15:45	6.5 ft
16:00	6.2 ft
16:15	5.8 ft
16:30	5.3 ft
16:45	4.9 ft
17:00	4.5 ft
17:15	4.0 ft
17:30	3.6 ft
17:45	3.2 ft
18:00	2.8 ft
18:15	2.4 ft
18:30	2.0 ft
18:45	1.8 ft
19:00	1.5 ft
19:15	1.3 ft
19:30	1.2 ft
19:45	1.1 ft
20:00	1.2 ft
20:15	1.2 ft
20:30	1.4 ft
20:45	1.6 ft
21:00	1.8 ft
21:15	2.1 ft
21:30	2.5 ft
21:45	2.9 ft
22:00	3.4 ft
22:15	3.8 ft
22:30	4.3 ft
22:45	4.8 ft
23:00	5.4 ft
23:15	5.9 ft
23:30	6.5 ft
23:45	7.0 ft
00:00	7.5 ft



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Tides:Duwamish Waterway, Eighth Ave. South

based on Seattle (Madison St), Elliot Bay Washington (NOAA)
47° 32 06 N 122° 19 18 W

Sunday, April 17, 2011

Average Tides	
Mean Range:	7.5 ft
MHHW:	11.1 ft
Mean Tide:	6.4 ft

Daily Highs & Lows		
04:32	11.6 ft	High
11:13	-0.8 ft	Low
17:47	11.0 ft	High
23:28	3.7 ft	Low

(PDT)	Tide
00:00	4.0 ft
00:15	4.5 ft
00:30	4.9 ft
00:45	5.4 ft
01:00	5.9 ft
01:15	6.5 ft
01:30	7.0 ft
01:45	7.7 ft
02:00	8.2 ft
02:15	8.8 ft
02:30	9.3 ft
02:45	9.8 ft
03:00	10.2 ft
03:15	10.6 ft
03:30	11.0 ft
03:45	11.2 ft
04:00	11.4 ft
04:15	11.6 ft
04:30	11.6 ft
04:45	11.6 ft
05:00	11.5 ft
05:15	11.3 ft
05:30	11.1 ft
05:45	10.7 ft
06:00	10.4 ft
06:15	9.9 ft
06:30	9.4 ft
06:45	8.9 ft
07:00	8.3 ft
07:15	7.6 ft
07:30	6.9 ft
07:45	6.2 ft
08:00	5.6 ft
08:15	4.8 ft
08:30	4.1 ft
08:45	3.4 ft
09:00	2.7 ft
09:15	2.0 ft
09:30	1.4 ft
09:45	0.8 ft
10:00	0.3 ft
10:15	-0.1 ft
10:30	-0.4 ft
10:45	-0.7 ft
11:00	-0.8 ft
11:15	-0.8 ft
11:30	-0.8 ft
11:45	-0.6 ft
12:00	-0.4 ft
12:15	0.0 ft
12:30	0.4 ft
12:45	0.9 ft
13:00	1.4 ft
13:15	2.0 ft
13:30	2.7 ft
13:45	3.3 ft
14:00	4.0 ft
14:15	4.7 ft
14:30	5.5 ft
14:45	6.2 ft
15:00	6.9 ft
15:15	7.6 ft
15:30	8.2 ft
15:45	8.7 ft
16:00	9.3 ft
16:15	9.7 ft
16:30	10.1 ft
16:45	10.4 ft
17:00	10.7 ft
17:15	10.9 ft
17:30	11.0 ft
17:45	11.0 ft
18:00	11.0 ft
18:15	10.9 ft
18:30	10.8 ft
18:45	10.5 ft
19:00	10.3 ft
19:15	10.0 ft
19:30	9.6 ft
19:45	9.2 ft
20:00	8.8 ft
20:15	8.3 ft
20:30	7.8 ft
20:45	7.4 ft
21:00	6.9 ft
21:15	6.4 ft
21:30	5.9 ft
21:45	5.4 ft
22:00	5.0 ft
22:15	4.6 ft
22:30	4.3 ft
22:45	4.0 ft
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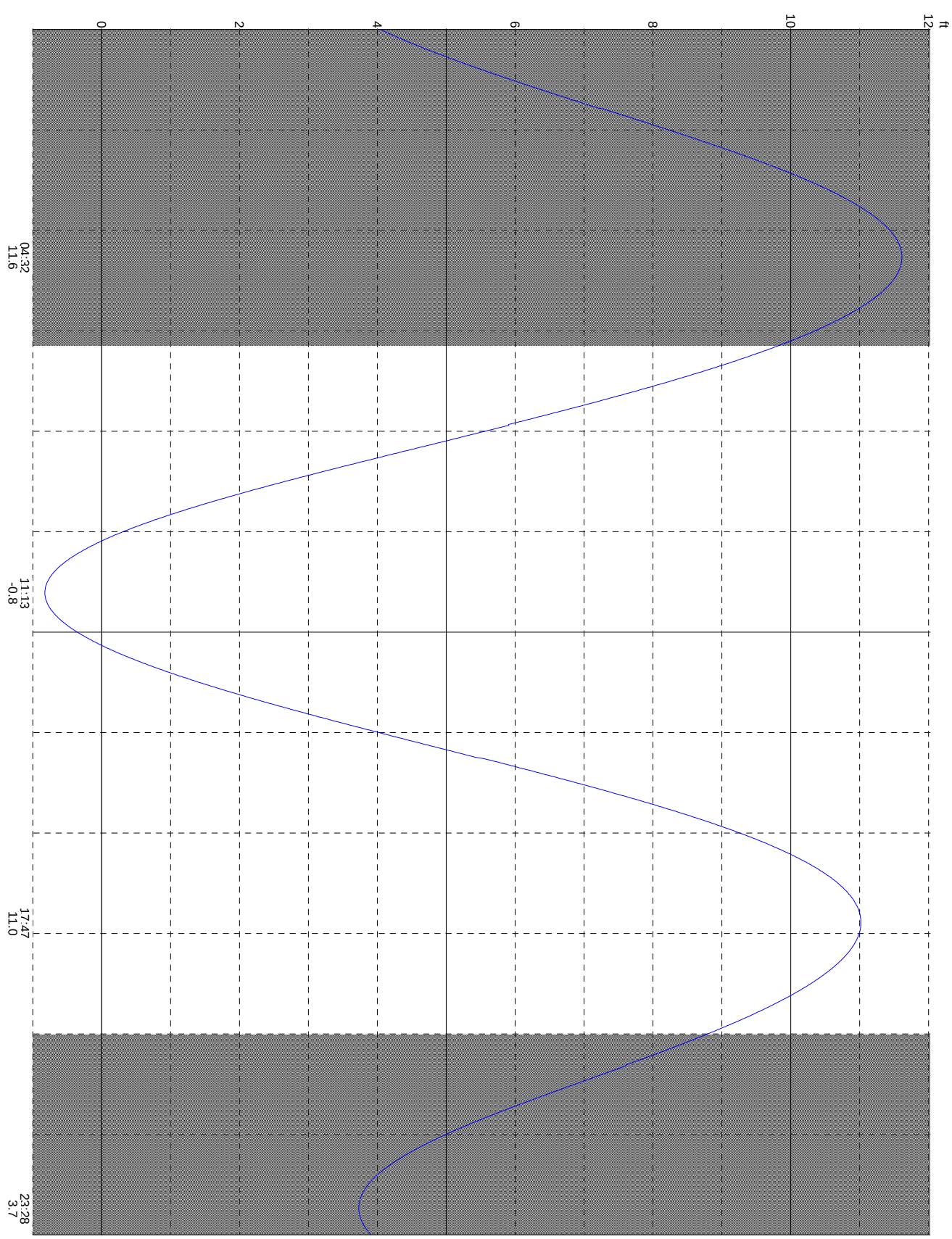
23:45	3.8 ft
00:00	3.9 ft



APPENDIX D

Salinity Data (Electronic Data Files)

Salinity Data (Electronic Data Files)
are not included in this pdf